TRANSCRIPT OF RECORD.

UPREME COURT OF THE UNITED STATES.

No. 231.

HE ILLINOIS CENTRAL RAILROAD COMPANY, PLAINTIFF IN ERROR,

vs.

SAMUEL H. TURRILL AND CHARLES WORMLEY.

IN ERROR TO THE CIRCUIT COURT OF THE UNITED STATES FOR THE NORTHERN DISTRICT OF ILLINOIS.

FILED JANUARY 2, 1868.

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Porter G.

SUPREME COURT OF THE UNITED STATES.

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1 Pleas in the circuit court of the United States of America for the northern district of Illinois, held at the United States court-room in the city of Chicago, in the district aforesaid, before the Hon. David Davis, one of the justices of the Supreme Court of the United States, presiding, and the Hon. Thomas Drummond, judge of the district court of the United States for the said northern district, associate, judges of said circuit court, on Friday, the eighth day of November, in the adjourned October term of said court, in the year of our Lord one thousand eight hundred and sixty-seven, and of our independence the ninety-second year.

WILLIAM H. BRADLEY, *Clerk.*

4945.

SAMUEL H. TURRELL & CHARLES WORMELEY
vs.
THE ILLINOIS CENTRAL RAILROAD COMPANY. } Trespass on the case.

2 NORTHERN DISTRICT OF ILLINOIS, *ss:*

Be it remembered that on the ninth day of July, in the year of our Lord one thousand eight hundred and sixty-one, came Samuel H. Turrell and Charles Wormeley, plaintiffs, by Walker, Van Arman & Dexter, their attorneys, and filed in the office of the clerk of the circuit court of the United States for the northern district of Illinois, at Chicago, in said district, their præcipe for a writ of summons against the Illinois Central Railroad Company, defendant, and also at the same time filed in the said clerk's office their declaration and bond for costs in the said entitled cause, which said præcipe, declaration, and bond are in the words and figures following, to wit:

Præcipe.

UNITED STATES OF AMERICA,
Northern District of Illinois, ss:

Circuit court, July term, A. D. 1861.

SAMUEL H. TURRILL & CHARLES WORMELEY
vs.
THE ILLINOIS CENTRAL RAILROAD COMPANY. } In ————. Damages, $20,000.

3 The clerk of said court will issue a summons in the above cause, directed to the marshal of said district, in a plea of trespass on the case, returnable on the first Monday of October, A. D. 1861, to the damage of the plaintiffs of twenty thousand dollars.

WALKER, VAN ARMAN & DEXTER,
Plaintiffs' Attorneys.

To WILLIAM H. BRADLEY, Esq., *Clerk.*
CHICAGO, *July 8th*, 1861.

Endorsed: "Filed this 9th day of July, 1861.
"WM. H. BRADLEY, *Clerk.*"

4 *Declaration.*

The circuit court of the United States for the seventh circuit and northern district of Illinois, of the 3d day of July, A. D. 1861.

NORTHERN DISTRICT OF ILLINOIS, *ss:*

Samuel H. Turrell and Charles Wormly, who are citizens of the State of Illinois, by Walker, Van Arman & Dexter, their attorneys, come and file this their declaration as commencement of suit, and complain of the Illinois Central Railroad Company, a corporation created by virtue of, and existing under, the laws of the State of Illinois, in a plea of trespass on the case.

5 For that one Joseph D. Cawood, of the city of Marshall, in the State of Michigan, was the original and first invention of a new and useful improvement in repairing railway bars, to wit: "An anvil or swage block for the purpose of welding up and reforming the ends of railroad rails where they have exfoliated or become shattered from unequal wear, occasioned by the inequalities of the road," in all as set forth in his specifications and drawings in the letters patent hereinafter mentioned and fully described, the same being a new and useful improvement in the repairing of railway bars, as aforesaid, which was not known or used before his said invention, which was not at the time of his application for a patent, as hereinafter mentioned, in public use or on sale, with his consent or allowance.

And the said Cawood being so as aforesaid the inventor thereof, and being also a citizen of the United States, on the ninth day of
6 September, eighteen hundred and fifty-six, upon due application therefor did obtain letters patent therefor under the seal of the Patent Office of the United States, signed by the Secretary of the Interior, and countersigned by the Commissioner of Patents of the United States, bearing date the day and year aforesaid, whereby there was secured to him, his heirs, administrators, or assigns, for the term of fourteen years from and after the date of the patent, the full and exclusive right and liberty of making, constructing, using, and vending to others to be used the said invention and improvement as by the said letters patent in court to be produced will more fully appear.

And the said plaintiff further says that the said Cawood exercised and enjoyed the right secured to him by the said letters patent from the said ninth day of September, 1856, to the eleventh day of November, 1856, on which last-mentioned day the said Cawood, by his deed of that date, for a valuable consideration, conveyed to one Francis W. Shear-
7 man one-third of his right and claim in the said letters patent; and, also, on the first day of June, A. D. 1857, said Cawood, by his deed, conveyed, for a valuable consideration, to said Francis W. Shearman and one George Johnson, each one undiv'ed fourth, and to one Darius Clark and to one Emmons Clark, each one undivided eigth parts right under said patent, reserving to himself one undivided fourth of his right and claim in the said letters patent, and also excepting therefrom and from said conveyance the right heretofore conveyed to the Michigan Central Railroad Company, New York Central Railroad Company, Cincinnati, Hamilton, and Dayton Railroad Company, Galena, Chicago, and Union Railroad Company, Chicago and Rock Island Railroad Company, Indianapolis, Pittsburg, and Cleveland Railroad Company, Belle Fountain and Indiana Railroad Company, Little Miami, Columbus, and Xenia Railroad Company, to make and to use
8 said invention and improvement for their own use and roads, and also excepting the right to make and vend to others to be used

the said invention in the State of Wisconsin; and, further, that on said June 1st, 1857, the said Francis W. Shearman and George Johnson, by their joint deed of that date, for a valuable consideration, reconveyed and reassigned to the said Cawood all their right and claim in the said letters patent; and, further, that said Darius Clark and Emmons Clark, on the twenty-first day of September, 1858, by their joint deed of that date, conveyed to one David H. Williams, for a valuable consideration, all their right and claim in said letters patent; and, further, that the said Francis W. Shearman, on the first day of March, 1859, by his deed of that date, for a valuable consideration, conveyed all his right and claim in said letters patent to one Benoni S. Gleason; and, further, that said
9 David H. Williams, on the tenth day of March, 1859, by his deed of that date, for a valuable consideration, conveyed all his right and claim in said letters patent to said Francis W. Shearman; and, further, that said Francis W. Shearman, on the tenth day of March, 1859, by his deed of that date, for a valuable consideration, conveyed to one Benoni S. Gleason, all his right and claim, delivered under the last-mentioned deed (of David H. Williams, to him), in the said letters patent; and, further [and, further], that the said Francis W. Shearman, on the eleventh day of March, 1859, by his deed of that date, conveyed, for a valuable consideration, to the said Benoni S. Gleason, all his interest in said letters patent, derived by the assignment of said David H. Williams to him, and, also, of the assignment of said Shearman and others above referred to, bearing date June 1st, 1857; and, further, that the said Benoni S. Gleason and Joseph D. Cawood and George
10 Johnson, on the eighteenth day of October, 1859, by their joint deed of that date, for a valuable consideration, conveyed to William H. Dunning and Charles Wormly, one of the plaintiffs herein, all their right and claim in said letters patent; and, further, that the said William H. Dunning and the plaintiff Charles Wormly, on the twenty-third day of August, 1860, by their joint deed of that date, for a valuable consideration, conveyed to the plaintiff Samuel H. Turrill, the fifty-five per cent., meaning thereby fifty-five one-hundredths part interest on said letters patent, excepting the right to make, vend, and use said invention and improvement in the States of Wisconsin and California; and, further, that the said William H. Dunning, on the twenty-third day of August, 1860, by his deed of that date, for a valuable consideration, conveyed to the said plaintiff Wormly, all his right and claim in said letters patent, as fully appears by said several deeds of assign-
11 ment duly executed and recorded, in this court to be produced, will more fully appear, whereby said plaintiffs became possessed of the entire and sole right and power in them and their assigns to make, use, and vend to others to be used, the said invention and improvement, except as aforesaid excepted, for repairing railway bars.

And the said plaintiffs say that from the time of the said conveyances and assignments to them, as aforesaid, hitherto, the said exclusive right has been, and now is, of great value, to wit, of the value of $50,000; yet the said Illinois Central Railroad Company, well knowing the premises, but contriving to injure the plaintiff, did, afterwards, on the 24th day of August, A. D. 1860, during the said term of fourteen years, and before the filing of this declaration at the place aforesaid, to wit, the northern district of Illinois, unlawfully and wrongfully, and without the consent and allowance, and against the will of the plaintiff, make, use, and vend
12 the said invention and improvement in violation and infringement of the exclusive right so secured to the plaintiff as aforesaid, and contrary to the form of the statute of the United States in such case made and

provided, whereby the plaintiffs have been greatly injured, and deprived of great profits and advantages which they might and otherwise would have derived from said invention, and have sustained actual damage to the amount of twenty thousand dollars, and, by force of the statute aforesaid, an action hath accrued to them to recover the said actual damage as the court may see fit to order and adjudge; yet the said Illinois Central Railroad Company, though requested, have never paid the same, or any part thereof, to the plaintiff, but have refused, and yet refuse, so to do.

WALKER, VAN ARMAN & DEXTER,
Pl'ffs' Att'ys.

(Endorsed:) Filed July 9, 1861.

WM. H. BRADLEY, *Clk.*

13 *Bond.*

UNITED STATES OF AMERICA,
Northern District of Illinois, ss:

Circuit court, July term, A. D. 1861.

SAM'L H. TURRILL ET AL.
vs.
THE ILLINOIS CENTRAL R. R. CO. } In trespass.

I enter myself security for costs in this cause, and promise to pay all costs which may accrue to the opposite party in this action, or to any of the officers of this court, and, in default of payment by the plaintiffs of any costs ordered or adjudged to be paid by them, hereby agree and stipulate that execution may issue against my property for any costs taxed against them.

Dated this eighth day of July, A. D. 1861.

JOHN VAN ARMAN. [SEAL.]

Endorsed: "Filed July 9th, A. D. 1861.
"WM. H. BRADLEY, *Clerk.*"

And on this day, to wit, the ninth day of July, A. D. 1861, a writ of summons issued out of the said clerk's office against the said defendant in the said entitled cause; which said writ, together with the return of the marshal thereon, is in the words and figures following, to wit:

14 *Summons.*

Circuit court of the United States of America.

NORTHERN DISTRICT OF ILLINOIS, *ss:*

The United States of America to the marshal of the northern district of Illinois, greeting:

We command you that you summon the Illinois Central Railroad Company, if it shall be found in your district, to be and appear before our judges of our circuit court of the United States for the northern district of Illinois, at the October term thereof, to be holden at Chicago, in the district aforesaid, on the first Monday of October next, to answer unto Samuel H. Turrill & Charles Wormeley in a plea of trespass on

the case to their damage, as they allege, of twenty thousand dollars; and have you then and there this writ.

Witness the Hon. Roger B. Taney, Chief Justice of the Supreme Court of the United States of America, at Chicago aforesaid, this 9th day of July, in the year of our Lord one thousand eight hundred and sixty-one, and of our independence the 86th year.

[SEAL.] WM. H. BRADLEY, *Clerk.*

15 I have this 28th day of August, A. D. 1861, served the within writ by leaving a copy of the same in the hands of W. H. Osborn, president of the within-named Illinois Central Railroad Company.

J. R. JONES,
U. S. Marshal of the Northern Dist. of Illinois,
By GEO. L. WEBB, *Deputy.*

Endorsed: Filed August 28, A. D. 1861.
WM. H. BRADLEY, *Clerk.*

Plea.

And on this day, to wit, the seventh day of October, A. D. 1861, came the said defendant, by Scates, McAllister & Jewett, its attorneys, and filed in the said clerk's office its plea in the said entitled cause; which said plea is in the words and figures following, to wit:

UNITED STATES OF ILLINOIS,
Northern District of Illinois ss:

In the circuit court of the United States for said district, of the October term, A. D. 1861.

16 SAMUEL H. TURRILL & CHARLES WORMLY
vs.
ILLINOIS CENTRAL RAILROAD COMPANY.

And the said defendant, by Scates, McAllister & Jewett, its attorneys, comes and defends the wrong & injury when, &c., and says that it is not guilty of the said supposed grievances above, and in the said plaintiffs' declaration, laid to its charge, or any or either of them, or any part thereof, in manner and for the, and the said plaintiff have above thereof complained against it; and of this the said defendant puts itself upon the country, &c.

SCATES, McALLISTER & JEWETT,
Att'ys for Def't.

And the said plaintiff doth the like.

BECKWITH, AYER & KALES,
Attorneys for the Plaintiffs.

Endorsed: "Filed Oct. 7, 1861.
"WM. H. BRADLEY, *Clk.*"

17 *Notice of special matter by def't.*

And on this day, to wit, the sixth day of April, A. D. 1865, came the said defendant, by McAllister, Jewett & Jackson, its attorneys, and filed in the said clerk's office its notice of special matter in defense; which said notice, &c., together with an endorsement by the pl't'ffs thereon, is in the words and figures following, to wit:

Circuit court of the United States for the northern district of Illinois.

SAMUEL H. TURRILL & CHARLES WORMLEY
vs.
ILLINOIS CENTRAL RAILROAD COMPANY.

The plaintiff in the above-entitled cause will please take notice that the defendant will, on the trial of said cause, prove, in bar of said plaintiffs' action, that the said Joseph C. Cawood was not the original and first inventor of the device, improvement, or thing described and claimed by him in the letters patent of the United States referred to in the declaration in said cause, or of any material or substantial part thereof, as is claimed in the said plaintiffs' declaration.

18 And the said defendant will further prove on said trial as aforesaid, that the said alleged invention of the said Joseph D. Cawood was publicly used at the United States armory at Springfield, in the State of Massachusetts, long prior to the time when it is alleged the said Joseph D. Cawood invented the same; and that the said alleged invention, and the prior public use thereof, as aforesaid, was well known to one Sela Chandler, late of Springfield, in the State of Massachusetts aforesaid, now deceased.

And the said defendant will further prove on said trial as aforesaid, that the said alleged invention of the said Joseph D. Cawood was known to and publicly used by the mechanics and workmen employed in the United States armory at Springfield, in the State of Massachusetts, long prior to the time when it is alleged the said Joseph D. Cawood invented the same; and that a knowledge of such prior public use was had by John Cooley, Luke Pratt, N. F. Dorsett, and H. D. Wallace, now residing at Springfield, in said State of Massachusetts.

19 And the said defendant will further prove on said trial as aforesaid, that the said alleged invention of said Joseph D. Cawood was known to and publicly used by John Cooley, Luke Pratt, N. T. Dorsett, and H. D. Wallace, employees and workmen in the United States armory at Springfield, in the State of Massachusetts, now residing at said Springfield, in said State, long prior to the time when it is alleged the said Joseph D. Cawood invented the same; which said prior public use, as well as the knowledge thereof as aforesaid, the said defendant will upon the said trial prove by the said John Cooley, Luke Pratt, N. F. Dorsett, and H. D. Wallace, or some of them.

McALLISTER, JEWETT & JACKSON,
Att'ys for Def't.

To the plaintiffs above named, or Mess. Arrington & Dent, their att'ys.

Due service of the above and foregoing notice, by the delivery to us of a true and correct copy thereof, is admitted this 13th day of January, A. D. 1865.

S. H. TURRILL.
CHAS. WORMLY,
By S. H. TURRILL.

Endorsed: "Filed April 6, 1865.
"WM. H. BRADLEY, *Clk.*"

20 *Notice of special matter by def't.*

And on this day, to wit, the sixth day of April, A. D. 1865, came the said defendant, by its attorneys, and filed in the said clerk's office its

notice of special matter in defense; which said notice, &c., together with an endorsement by pl'tiffs' attorneys thereon, is in the words and figures following, to wit:

UNITED STATES OF AMERICA,
Northern District of Illinois, ss:

In the circuit court of the United States for the northern district of Illinois.

SAMUEL H. TURRILL & CHARLES WORMLEY
vs.
ILLINOIS CENTRAL RAILROAD COMPANY.

The plaintiffs in the above-entitled cause will please take notice that the defendant above named will prove on the trial in said cause, in bar of the said plaintiffs' action, that the said Joseph D. Caywood was not the original and first inventor of the thing described and claimed by him in the letters patent of the United States referred to in the declaration in said cause, or of any material or substantial part thereof, as is claimed in the said plaintiffs' declaration.

21 And the said defendant will further prove on said trial as aforesaid, that the said alleged invention of the said Joseph D. Caywood was known to and publicly used by Harris B. Johnson and Francis Chapin and others, of Springfield, in the State of Massachusetts, and Thomas Warner, now of Millbury, in said State of Massachusetts, at Springfield, in the State of Massachusetts, and at various other places, long prior to the time when it is alleged the said Joseph W. Caywood invented the same; and the said defendant will, on said trial, prove as aforesaid, by the said Harris B. Johnson, Francis Chapin, and Thomas Warner, or some of them, that a knowledge of such prior public use at Springfield aforesaid was had by them.

And the said defendant will further prove on said trial as aforesaid, that the said alleged invention of the said Joseph D. Caywood, described in the letters patent referred to in said plaintiffs' declaration, and the material and substantial parts thereof, were known and publicly used in the workshops of the Michigan Central Railroad Company and elsewhere, at Marshall, in the State of Michigan, long prior to the time when it is alleged the said Joseph D. Caywood invented the same; and

22 that a knowledge of such prior public use at Marshall, in the State of Michigan aforesaid, was had by Amos Wilson, Joseph I. Etheridge, Alexander McKinley, W. Primble, who now reside at Marshall aforesaid; William Duthin, who now resides at Lexington, in said State of Michigan; and Levi Wilson, who now resides at Peoria, in the State of Illinois; by which said last-named persons, amongst others, said defendant will on said trial prove such prior public use, at Marshall, in the State of Michigan, aforesaid; and also that the said Joseph D. Caywood surreptitiously and unjustly obtained the said letters patent for that which was in fact invented or discovered by another, to wit, one James McClellan, who, in the years 1852 and 1853, resided at said Marshall, in the State of Michigan, and who was using reasonable diligence in adopting and perfecting the same.

And the said defendant will further prove on said trial as aforesaid, that the said alleged invention of the said Joseph D. Caywood, described in the letters patent referred to in the said declaration, and the substantial and material parts thereof, were publicly used in the city of Cincinnatti, in the State of Ohio, long prior to the time when it is alleged the

said Joseph D. Cawood invented the same, and that a knowledge
23 of such prior public use at Cincinnatti aforesaid, was had, and the same will be proved, by one ——— Greenleaf (whose first name is unknown to said defendant), who now resides at Indianopolis, in the State of Indiana, and is in charge of a locomotive or repair shop at said Indianopolis.

And the said defendant will further prove upon said trial as aforesaid, that the same thing alleged to have been invented by the said Caywood, and patented to him as aforesaid, and every substantial and material part thereof, was known and publicly used at Tonawanda, in the State of New York, long prior to the time when it is alleged the said Caywood invented the same; and that a knowledge of such prior public use at Tonawanda aforesaid was had, and the same will be proved, by one ——— Hovey, whose first name is also unknown to said defendant, but who now resides at Cleveland, in the State of Ohio, and is at present master mechanic of the Cleveland and Pittsburgh railroad.

And the said defendant will further prove on said trial as aforesaid, that the said alleged invention of the said Joseph D. Caywood,
24 described in the letters patent referred to in said declaration of the said plaintiffs, and the substantial and material parts thereof, were known and publicly used at Marshall, in the State of Michigan, long prior to the time when it is alleged the said Joseph D. Caywood invented the same, and that a knowledge of such prior public use at Marshall aforesaid was had by one James McClellan, of said Marshall.

Also, that the said alleged invention of the said Caywood was known and publicly used at Troy, in the State of New York, long prior to the time when it is alleged the said Caywood invented the same, and that a knowledge of such prior public use at Troy aforesaid was had by one William Burden, of said Troy.

Also, that the said alleged invention of the said Caywood was known and publicly used at Howell Works, Monmouth County, New Jersey, long prior to the time when it is alleged the said Caywood invented the same, and that a knowledge of such prior public use at said Howell Works was had by James P. Smith, of Jamesburg, New Jersey; Alfred H. Smith, of Jamaica, Long Island, in the State of New York; Joseph M. Ninney, of Squan, Monmouth County, New Jersey; and Fred-
25 erick Stokey, of said Howell Works aforesaid, and others; and the said defendant will, upon the trial aforesaid, prove by the said James McClellan, William Burden, James P. Smith, Alfred H. Smith, Joseph M. Ninnery, Frederick Stokey, and others, the public use of said alleged invention of the said Joseph D. Caywood, at the same place aforesaid, long prior to the time when the said Caywood is alleged to have invented the same, and also that the thing or machine patented to the said Caywood, and described in the patent referred to in said plaintiffs' declaration, was in public use, with the consent and allowance of the said Caywood, for more than two years prior to his application for a patent therefor.

And the said defendant will further prove on said trial as aforesaid, that the said alleged invention of the said Joseph D. Caywood, described in the letters patent referred to in the plaintiffs' declaration, and the substantial and material parts thereof, were known to and publicly used by Henry Asseltyne, of Swanton, in the State of Vermont; J. P. Sherwood, of Fort Edward, in the State of New York; H. I. Wilson, of Chicago, in the State of Illinois; George L. Whitney, of Boston, in the State of Massachusetts; Robert H. Eddy, also of Boston afore-
26 said; James Whitcomb, of Watertown, in the State of New York;

James R. Sweeny, also of said Watertown; George S. Griggs, of Roxbury, in the State of Massachusetts; George Richards, also of said Roxbury; and Edwin Garfield, of Hartford, in the State of Connecticut; and that the said alleged invention or device of the said Caywood, and material and substracted parts thereof, were publicly used by each of the several persons above named, respectively, at their respective places of residence aforesaid, prior to the time when it is alleged the said Caywood invented the same; and that the several persons aforesaid, and each of them, had knowledge of such prior public use of said invention or device, and the material and substantial parts thereof, at the several places aforesaid.

And the said defendant will further prove upon said trial as aforesaid, in bar of the said plaintiffs' action, that, prior to the alleged invention or discovery by the said Joseph D. Caywood of the thing claimed and alleged to be patented to him in and by the letters patent referred to in the declaration of the said plaintiffs, the same and every
27 material and substantial part thereof were described in the following-named public works; that is to say—

In the "Transactions of the Society instituted at London for the Encouragement of Arts, Manufactures, and Commerce," vol. 48, London, 1831; and particularly at the article commencing at page 250, and extending through pages 259, 260, and 261 of said public works.

In the "Technological Encyclopedia," by Johann Joseph Prechtt, vol. 2 of plates; plates 336, 337, and 338, and pages 104 to 131, both inclusive; published at Stuttgard, in 1846; the said public work being in the German language.

In Holtzopffel's Turning and Mechanical Manipulations, volume 2, London, 1847; and especially at pages 858, 859, and 860 of said public work.

In the Cyclopedia, or Universal Dictionary, of Arts, Sciences, and Literature, by Abraham Rees, D. D., F. R. S., & F. L. S. S. S. Amer. Assoc. First American edition; article, Forgeing.

In the "Treatise on the Progressive Improvement and Present State of the Manufactures in Metal," vol. first; title, "Iron and Steel;" printed at London for Longman, Brown, Green & Longman, Paternoster
28 Row, and John Taylor, Upper Gower street, in 1847; page 215, figure 72.

In "The Practical Metal-Maker's Assistant," by Oliver Byrne, Philadelphia, Henry Cary Baird, 1851; and particularly at pages 25 (figure 8), 26 (figures 9, 10, 11, & 12), 35 (figures 16 & 17, on said page), 60 & 61 (figures 67), of said public work.

And the said defendant will further prove upon said trial as aforesaid, in bar of the said plaintiffs' action, that prior to the alleged invention or discovery by the said Joseph D. Caywood of the thing claimed and alleged to be patented to him, in and by the letters patent referred to in said plaintiffs' declaration, the same was, and the substantial and material parts thereof were, described, contained, represented, and made public in the following-named letters patent, respectively, and the drawings respectively thereto annexed, and forming a part thereof:

Letters patent of the United States, issued on the 31st day of December, 1845, to Samuel G. Reynolds, of Bristol, in the State of Rhode Island, for a machine for heading and pointing pins.

Letters patent of the United States, issued on the 3d day of September, 1846, to Thomas W. Harvey, of the city and State of New York, for a machine for heading screw blanks.

29 Letters patent of the United States, issued on the 8th day of

May, 1849, to Davis L. Weatherhead, of Providence, in the State of Rhode Island, for an improved method of constructing and operating the header in bolt machines.

Letters patent of the United States, issued on the 18th day of June, 1850, to ——— M. George, of Nashua, in the State of New Hampshire, for a spike machine.

Letters patent of the United States, issued on the 16th day of July, 1850, to Moore Hardaway, of Troy, in the State of New York, for a spike machine.

Letters patent of the United States, issued on the 30th day of July, 1850, to William E. Ward, of Port Chester, in said State of New York, for an improved bolt and rivet machine.

Letters patent of the United States, issued on the 20th day of August, 1850, to John Van Brocklin, of Middleport, in said State of New York, for an improvement in machinery for heading bolts, rivets, &c.

Letters patent of the United States, issued on the 23d day of December, 1851, to Nathan Starks, of Albany, in said State of New York, for an improvement in "bolt-heading machinery."

30 Letters patent of the United States, issued on the 4th day of March, 1856, to George Woodward, of Brunswick, in the State of Maine, for an improved machine for heading bolts.

Letters patent of the United States, issued on the 14th day of September, 1852, to G. H. Richards, assignor to C. G. Plimpton, for an improvement in forging machines.

Letters patent granted in England, in the year 1846, to William Church, for machinery for stamping, flattening, and shaping metals, &c., number 11,196, and especially at figures 12, 13, 22, 28, 29, 30, and 34 of the drawings annexed thereto, and the text of the specifications thereof description of said figures.

JNO. N. JEWETT, *Att'y for Def't.*

JUNE 10*th*, 1862.

To Messrs. WALKER, VAN ARMAN & DEXTER, *Attorneys for Pl'f's.*

Service of the above and foregoing notice, by delivery of a copy thereof to us, is admitted this 10th day of June, A. D. 1862.

WALKER, VAN ARMAN & DEXTER,
Att'ys for Pl'ff.

Endorsed: "Filed April 6, 1865.

"WM. H. BRADLEY, *Cl'k.*"

31 *Appearance of att'ys for pl'ff.*

And on this day, to wit, the twenty-fourth day of October, A. D. 1867 came Messrs. Beckwith, Ayer & Kales, and filed in the said clerk's office their appearance as attorneys for the plaintiffs in the said entitled cause; which said appearance is in the words and figures following, to wit:

United States circuit court, northern district of Illinois.—October term 1867.

SAMUEL H. TURRILL & CHARLES WORMLEY
vs.
THE ILLINOIS CENTRAL RAILROAD COMPANY.

We hereby enter our appearance as attorneys for the plaintiffs in the above-entitled cause.

October 24th, 1867. BECKWITH, AYER & KALES.

Endorsed: "Filed Oct. 24th, 1867.

"WM. H. BRADLEY, *Clk.*"

32 *Stipulation.*

And on this day, to wit, the twenty-fourth day of October, A. D. 1867, came the respective plaintiffs and defendant, by their attorneys, and filed in the said clerk's office their mutual stipulation in the said entitled cause; which said stipulation is in the words and figures following, to wit:

United States circuit court, northern district of Illinois.—October term, A. D. 1867.

SAMUEL H. TURRILL AND CHARLES WORMLEY
vs.
ILLINOIS CENTRAL RAILROAD COMPANY.

It is hereby stipulated and agreed by the attorneys of the respective parties to the above-entitled suit, that the issue joined in the said cause shall be tried and determined by the court at the present term thereof, before the Honorable David Davis and Thomas Drummond, judges of said court, without the intervention of a jury; a jury trial being hereby waived, pursuant to the statute in such case made and provided.

33 Neither party, however, being understood to waive the right to request the court to make a special finding or special findings in the case, and to state the facts upon which its judgment may be granted, but neither party hereby consenting that such request of the other party shall be granted by the court.

Chicago, October 24th, 1867.

BECKWITH, AYER & KALES,
Attorneys for Pl'ffs.
JNO. N. JEWETT, *Att'y for Def't.*

Endorsed: "Filed Oct. 24, 1867.

"WM. H. BRADLEY, *Clerk*".

And on this day, to wit, the twenty-fourth day of October, in the adjourned October term, A. D. 1867, of said court, in the record of the proceedings thereof in the said entitled cause is the following entry, to wit:

34 SAMUEL H. TURRILL AND CHARLES Wormley
vs.
THE ILLINOIS CENTRAL RAILROAD COMPANY. } Trespass on the case.

Now come the parties, by their attorneys, and, upon issue joined, by agreement and as per stipulation filed, they waive the intervention of a jury, and for trial put themselves upon the court; and, after hearing a part of the evidence, the hour of adjournment having arrived, the further trial of the cause is postponed until to-morrow morning.

And on this day, to wit, the twenty-fifth day of October, in the adjourned October term, A. D. 1867, of said court, in the record of the proceedings thereof in the said entitled cause is the following entry, to wit:

35 SAMUEL H. TURRILL AND CHARLES Wormley *vs.* THE ILLINOIS CENTRAL RAILROAD COMPANY. } Trespass on the case.

Now come again the parties, by their attorneys; and, after hearing additional evidence, the hour of adjournment having arrived, the further trial of the cause is postponed until to-morrow morning.

And on this day, to wit, the twenty-sixth day of October, in the adjourned October term, A. D. 1867, of said court, in the record of the proceedings thereof in the said entitled cause is the following entry, to wit:

SAMUEL H. TURRILL AND CHARLES WORMLEY *vs.* THE ILLINOIS CENTRAL RAILROAD COMPANY. } Trespass on the case.

Now come again the parties, by their attorneys; and, after hearing additional evidence, the hour of adjournment having arrived, the
36 further trial of the cause is postponed until Monday morning next.

And on this day, to wit, the twenty-eighth day of October, in the adjourned October term, A. D. 1867, of said court, in the record of the proceedings thereof in the said entitled cause is the following entry, to wit:

SAMUEL H. TURRILL AND CHARLES WORMLEY *vs.* THE ILLINOIS CENTRAL RAILROAD COMPANY. } Trespass on the case.

Now come again the parties, by their attorneys; and, after hearing the concluding evidence, the hour of adjournment having arrived, the arguments of counsel are postponed until to-morrow morning.

And on this day, to wit, the twenty-ninth day of October, in the adjourned October term, A. D. 1867, of said court, in the record of the proceedings thereof in the said entitled cause is the following entry, to wit:

37 SAMUEL H. TURRILL AND CHARLES Wormley *vs.* THE ILLINOIS CENTRAL RAILROAD COMPANY. } Trespass on the case.

Now come again the parties, by their attorneys; and, after hearing the arguments of counsel, the court, not being sufficiently advised in the premises, takes time to consider.

And on this day, to wit, the eighth day of November, in the adjourned October term, A, D. 1867, of said court, in the record of the proceedings thereof in the said entitled cause is the following entry, to wit:

SAMUEL H. TURRILL & CHARLES WORMELEY *vs.* THE ILLINOIS CENTRAL RAILROAD COMPANY. } Trespass on the case.

The court, having considered, and being now fully advised upon the

matters heretofore submitted herein, find the defendant guilty,
38 and assess the plaintiffs' damages to the sum of twelve hundred and ninety-two dollars. It is thereupon considered and adjudged by the court, that the said plaintiffs do have and recover of the said defendant the said sum of twelve hundred and ninety-two dollars, their damages so as aforesaid assessed, together with their costs and charges by them about their suit in this behalf expended, amounting to the sum of dollars and cents; and that they have execution therefor.

39 On the hearing of said cause the following exceptions were taken, and were allowed by the court, and are in the words and figures following, to wit:

United States circuit court for northern district of Illinois.

SAMUEL H. TURRILL AND CHARLES WORMLEY
vs.
ILLINOIS CENTRAL RAILROAD COMPANY.

Be it remembered that upon the trial of said cause before the honorable the judges of said court, in pursuance of a stipulation of the parties therein, filed at the October term, A. D. 1867, of said court, to wit, on the 24th day of October, A. D. 1867, the plaintiffs, to sustain the issues on their part, offered and read in evidence letters patent of the United States, bearing date the 9th day of September, A. D. 1856, issued to Joseph D. Cawood, as follows:

40 The United States of America to all to whom these letters patent shall come:

Whereas Joseph D. Cawood, of Marshall, Michigan, has alleged that he has invented a new and useful improvement in repairing railway bars, which he states has not been known or used before his application; has made oath that he is a citizen of the United States; that he does verily believe that he is the original and first inventor or discoverer of the said improvement; and that the same hath not, to the best of his knowledge and belief, been previously known or used; has paid into the Treasury of the United States the sum of thirty dollars; and presented a petition to the Commissioner of Patents, signifying a desire of obtaining an exclusive property in the said improvement; and praying that a patent may be granted for that purpose:

These are, therefore, to grant, according to law, to the said Joseph D. Cawood, his heirs, administrators, or assigns, for the term of fourteen years from the ninth day of September, one thousand eight hun-
41 dred and fifty-six, the full and exclusive right and liberty of making, constructing, using, and vending to others to be used, the said improvement, a description whereof is given in the words of the said Cawood in the schedule hereunto annexed, and is made a part of these presents.

In testimony whereof, I have caused these letters to be made patent, and the seal of the Patent Office has been hereunto affixed.

Given under my hand at the city of Washington, this ninth day of September, in the year of our Lord one thousand eight hundred and fifty-six, and of the independence of the United States of America the eighty-first.

[L. S.]

GEO. C. WHITING,
Acting Secretary of the Interior.

Countersigned and sealed with the seal of the Patent Office.

C. MASON,
Commissioner of Patents.

42 *The schedule referred to in these letters patent and making part of the same.*

To all whom it may concern:

Be it known that I, Joseph D. Cawood, of the town of Marshall, county of Calhoun, and State of Michigan, have invented a new and useful improvement in the common anvil or swage block, for the purpose of welding up and reforming the ends of railroad rails, when they have exfoliated or become shattered from unequal wear, occasioned by the inequalities of the road (six inches or so of the extreme end of the rail being frequently destroyed, while the remainder is perfectly sound); and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawing making a part of this specification, and giving a perspective view of the machine: A representing the bed-sill on which the anvil is placed; B, the anvil or swage block, of cast-iron; C C, recesses, or dies, across the face, the shape of the side
43 of the rail; D, solid block, making a part of the anvil, with its side shaped to the side of the rail while placed in its natural position; E, a movable press-block, held down to anvil by dovetail tongue *a* on the anvil, and grooves in the movable press-block, and operated, by two eccentric cams, back and forth in a longitudinal direction, to press the rail together while forming its end, and with sufficient travel to extricate the rail without altering its vertical position; G, a rail of the T form, in its position between the press-blocks.

I usually make my improved anvil and swage block of cast-iron, between four and five feet long and sixteen inches wide across the face, with two forms or recesses C C, at one end, right and left, of a form corresponding with the side of the rail; close to these is cast a raised block D, nearly as high as the rail, and with its farthest edge also shaped to fit the side of the rail when it lies across the anvil in its natural position.

Next, then, I attach to the face of the anvil, by dovetail tongues
44 and grooves, or any other convenient manner, what I call a movable press-block E, with a similar but reverse-shaped edge, lying opposite the other, so as to enclose the rail between the two as in the jaws of a vice. This block I work by two eccentric cams F on a shaft, which is attached to the anvil by two standards H H, with bearings I I, either cast on or bolted to the edge of the same, so that half a turn of the crank will move the press-block over a space a little more than the extreme width of the rail. The mode of using the machine is extremely simple and effective. A piece of iron (being of a size suitable to the deficiency of the rail) having been prepared and put into the fire, the rail, being suspended by its middle to the level of the anvil, is brought to a welding heat, and then swung around from the fire into the space between the two blocks, when it is, by a half turn of the crank, pinched together by means of the cams F; the welding piece is then laid on the top of the rail and welded to the rail in the usual way, and beveled up and shaped by a swage, held by the smith, of the form of that
45 section, which projects above the blocks, thus accomplishing at one heat what usually requires three or more. Should any imperfections remain, which is not usual if the first operation is properly gone through with, they can be removed by proper hand-swages, after placing the rail in the recesses C C for that purpose.

I do not claim the anvil-block, nor its recesses; but what I do claim as my invention, and desire to secure by letters patent, is, the movable press-block E, having its edge formed to the side of the rail G, in combination with another block D, with its edge of a similar but reversed form (the movable blocks to be operated by two cams, or in any other convenient manner), for the purpose of pressing between them a T or otherwise shaped rail, thereby greatly facilitating the difficult operation of welding and renewing the ends of such rails after they have been damaged in the manner herein described and set forth.

JOSEPH D. CAWOOD.

Witnesses:
GEORGE JOHNSON.
JAMES A. WAY.

46 (Here follows drawing, marked page 46.)

47 The plaintiffs, further to sustain the issues on their part, then offered and read in evidence a certified copy of the filing of the application of said the Joseph D. Cawood for said letters patent, showing that said application was filed in the Patent Office on the 22d day of March, A. D. 1853.

Stipulation.

The plaintiffs then offered and read in evidence as proof a stipulation signed by the respective parties, by their attorneys duly entitled in said cause, as follows, to wit:

"It is stipulated and agreed, by and on behalf of the parties to the above-entitled cause, as follows:

"1st. That the defendant is a corporation of the State of Illinois.

"2d. That at the time of the commencement of said cause, the plaintiffs were the assignees of all the rights of Joseph D. Cawood under the letters patent mentioned in the declaration in this cause, and that of the facts above agreed this stipulation may be used as evidence on the trial of said cause."

It was thereupon further admitted and agreed, in open court by the attorneys of the respective parties, as follows:

1st. That the plaintiffs' rights under the said letters patent, as assignees of the said Joseph D. Cawood, were acquired on the 20th day of August, A. D. 1860.

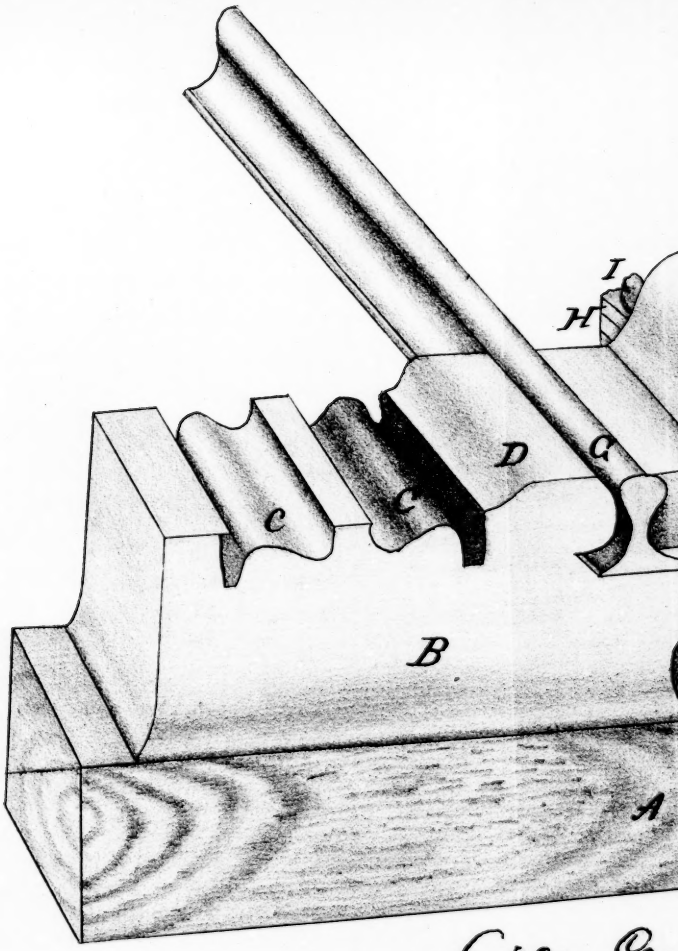
2d. That between that date and the date of the commencement of this suit, there were mended, in the shops of the defendant, 3,041 bars of railroad iron, the average length of weld upon which was 17.4
48 inches. That said repairing was done at the shops of the defendant at Chicago, La Salle, Nora, and Galena; one machine being in use at each of said shops for repairing rails.

3d. That the machines so in use by the said defendant infringed the claims of the said plaintiffs under the letters patent of said Joseph D. Cawood.

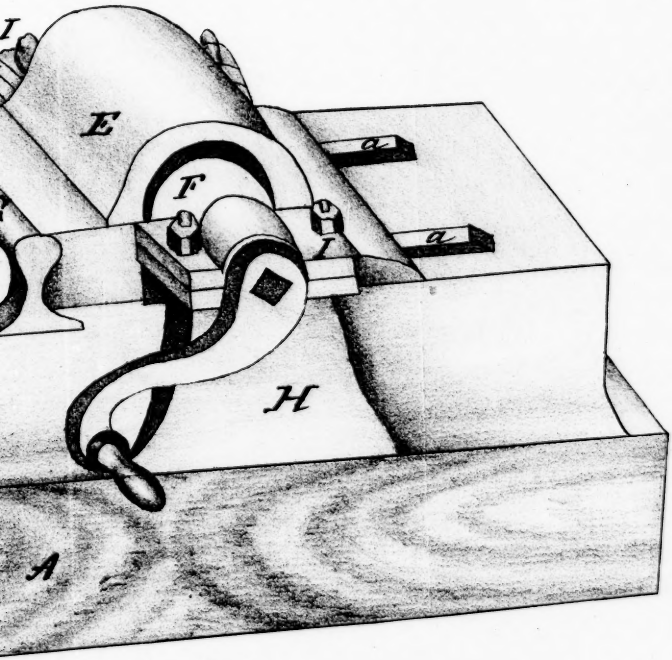
49 The plaintiffs, further to sustain the issues on their part, next produced as a witness—

PETER A. CRAIG, who, being first duly sworn, deposed in substance as follows:

I am a blacksmith; am engaged in repairing rails; have been for seven years on the Great Western and Grand Trunk railways in Can-



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ada; have worked on the common swage-block, or anvil, for repairing rails. In using the common block, I take an exfoliated rail, put it in the fire, heat it, take it out, and, with a chisel, scarf off the exfoliated parts; then put it back in the fire and heat it to a welding heat, then bring it back and lay in a piece of iron equal to the piece cut off, and then use a hand hammer, and my helper uses another. One lays on the piece. I begin by tapping it lightly, hammering, and swaging it along the top. During this operation it thickens up in the neck. To remedy this it is necessary to swage it back, which has a tendency to split the neck. By this old mode I can put on, very likely, four, six, or seven inches of welding at one heat; that is, after the scarfing. I could not
50 by the old method repair a fish-joint rail, because it would split in the neck and be useless. The old method of repairing weakens the rail in the neck on account of its being worked so much, and it is apt to be cracked. There is nothing to hold the neck from giving away. With two helpers and a man at the bellows, by the old method, we averaged seven or eight to nine and ten feet some days. That was all we could do; but it required one skillful mechanic at each anvil. I used the old method near three months, and have given a fair average of the work we were able to do in a day. I have used for six or seven years the patent swage-block, with jaws, in form like the Cawood model, now shown here. I have repaired for a month on this kind of block thirty-three feet and nine inches every day. Using this patent block, I take a rail, exfoliated, put it in the fire, and heat it to a welding heat, but never scarf the rail in this block; that saves me considerable time and work. I then take it out and put a piece on and slip
51 the rail into the jaws; I then with hammers weld in the piece, finishing off with a top swage; my helpers are in the mean time striking with fourteen-pound hammers as hard as they can. The jaws keep the neck of the rail in its regular shape, and you can hammer as hard as you please. When I get it top-swaged, I bring it out of the jaws and cut off the fins at the side with a chisel; then, turning it into a side swage, smoothing it off with a swage, which fetches it to its proper shape. The repaired part of a rail will last longer than a new rail, because hammering gives a hard scale on the top, the top being hammered when it is nearly cold. I put on at one heat a piece equal to the length of the jaws. By the old method, in repairing fourteen inches, I required at least from two to four heats. It could not be done in less than two after the rail is scarfed. By the old method, I used more coal in proportion to the quantity of work done. The old method would require more coal to repair the same quantity of feet, and also more iron,
52 because of the thickening up in the neck by the old process. The difference in cost by the two methods would amount to pretty near seventy cents a foot. It would cost about a dollar a foot by the old method, and might run two or three cents over.

Cross-examination:

The thirty-three feet and nine inches per day was solid welding. I did it two years ago last February for one month. In the Canada shops, where I have been working, if it is necessary to cut off a rail and change the holes in it, we are allowed a foot for it. It is a longer process than welding. I know what a U rail is. I have repaired them. They were used at one time on the Great Western railway, and are at the present time. I have repaired the U rail on the Smith & Beebe block by much the same process as the other. I have repaired them for four or five months altogether. I repaired them nearly the same as the T rail,

53 with this difference: the jaws were constructed with a piece fitting up into the hollow of the rail. This is all the difference. We had for that purpose a different cast block from this, with a piece in here between the jaws (indicating the model marked Smith & Beebe machine). This piece comes up into the hollow of the rail. The jaws come down square. We get the rail in just the same as the other one. This piece to support the U rail is a stationary piece in the U-rail block. You could not mend a U rail without changing the jaws as shown in the model; could not mend a U rail in the Cawood machine like the model without changing the jaws; would have to fit them to the U rail. That is all the difference, I should say; should put in jaws to fit the U rail substantially as described in the Beebe & Smith machine.

Direct-examination resumed:

In mending the U rail part of the anvil really projects up between the jaws, giving a solid support to the rail.

54 The plaintiffs, further to sustain the issue on their part, produce as a witness—

JOSEPH W. SMITH, who, being duly sworn, testified as follows:

I am a T-rail mender; have worked at the business for several years; first used, for a while, the common swage-block. In using this block, I found, after heating the rail, it was necessary, with a chisel, to chip down the damaged part of the rail sufficiently to get below the fracture. In doing this the chisel was liable to run below the proper depth. This would leave a gap, which was never rewelded again. Our swage-block was made like the model here, with swages on either side. We had a tool to fit in the flange, and against the head of the rail, and with heavy sledges every stroke of the helper would stretch out the shank and bring back the rail to its proper hight, after it had been depressed by welding on the top; used light hammers on the top. In working to get the
55 rail back, it often happened that the shank part of the rail would crack. So far as I was concerned, I could do very little on the common swage-block. I know what others have done. They did from five to seven and eight and nine feet. There is a difference in workmen. Have had a long experience with the machine. Have repaired rails on the machine which had previously been repaired on a common block. The road that I have been employed upon for the last ten years had used the common swage-block three years before I went there, and then introduced the Cawood patent. Much of the work repaired on the common block came back in consequence of defects in it. When I went there I had a little experience on a common swage-block on account of a detention of the machine. I have known rails taken from the shop and laid in the track in the morning, which had been mended on the common swage-block and returned at night to be replaced, not being properly repaired. I have repaired over, on the machine, three or four
56 hundred rails which had previously been welded on a common anvil-block, in a single year. Occasionally, I repair a second time on the block, in consequence of defective welding. It is not usual. From twenty to twenty-five feet a day is a general average for repairing T rails on a Cawood block.

Cross-examination:

I mean from twenty to twenty-five a day of solid welding.

57 The plaintiffs, further to sustain the issue on their part, produce as a witness—

WILLIAM T. RAGLAN, who, being duly sworn, testified as follows:

I reside at Bloomington, Illinois; am a machinist; repaired rails five years by contract, from 1858 to 1863; had sometimes seven machines; probably averaged five machines running; used what was known as the Cawood patent; made like this model called the Whitcomb machine; I had no experience with the common swage-block before using these machines; used one for one week for the purpose of testing what I could do with it; had one of my best men that worked with me; my work turned out about nine feet a day for six days. The result of mending on a common anvil was the mashing down of the rail. It was not possible to avoid it; used light hand hammers; probably two pounds. To bring the rail back again to its proper hight, we used a fuller. The almost invariable effect was to check or crack the neck of the rail. The
58 inspector rejected most of the rails so mended. I then went back to the machine. The work on the machine has always been satisfactory. Our mending was about twenty feet a day. The rails so mended lasted oftentimes longer than new rails, for the reason that the parts mended were more strongly united than the original iron. We used heavy sledges, weighing fourteen pounds, in mending on the patent block. In mending on the patent block, we only took one heat, except when we scarfed the rail before putting on the patch. By the old method we generally used three heats.

The plaintiffs, further to maintain the issue on their part, then offered and read in evidence the depositions of thirty witnesses, tending to show that the amount of work accomplished by the use of the common swage-block per day of ten hours, with one smith and two helpers, and the use of one fire, amounted to from eight to twelve feet of mending per
59 day; while, with the same assistance, with the use of the patent jaw-blocks, from twenty to twenty eight feet a day was accomplished; and that the use of the patent block occasioned a saving in coal and iron to some extent; and that while skilled mechanics were required to mend rails on the common block, ordinary workmen were competent to do the same on the Cawood machine.

60 Here the plaintiff rested.

The defendant, to sustain the issue upon its part, then produced as a witness—

JOSEPH CHERBANEAU, who, being first duly sworn, testified in substance as follows:

I reside in Chicago; I am a blacksmith by trade; have been a blacksmith for the Northwestern, Galena & Chicago, and the Milwaukee railroad; I commenced in 1852 for the Galena company, and worked three years; then went to work for the Milwaukee road, and worked there about six years; then went to work for the Galena company about two months. For these companies I was foreman of the blacksmith shops; was foreman for the Galena company for three months at Harlem; when I worked there the rail patching was done by the piece; we used a patent block with a slide and a lever, a block with jaws to it. With that block we did from twenty to twenty-five feet a day. From there
61 I went to the Northwestern shop, and took charge of a shop there. On the Northwestern we used the plain block; there they aver-

aged about twenty feet a day. The work was done well on a common block better than on the jaw-block; I kept an account of the work at these two shops part of the time; I would keep an account for a week to see how much the men got out. My statements as to the quantity, I derive from the accounts I kept. It was my business to keep an account.

Cross-examination:

I worked about three years for the Galena company, and about six years for the Milwaukee road. I was three months keeping the accounts of the patching done by the machine on the Galena road. That was, I think, about six years ago. I then went to the Northwestern company, and worked on a common block here in Chicago. I worked for the Northwestern company on a common block nearly three years. That company never used a machine to my knowledge; never used any
62 patent block on the Northwestern road while I was there; I was there in 1861, '62, and '63, in their shop in this city; I have been in the same shop since I left there; have had no machine excepting the ones in use when I worked there; have never had, so far as I know; never saw one there. We mended somewhere about twenty feet on a common block per day. I was foreman of the shop. I kept an actual account of the work done on a common block. I marked it down myself. I recollect being a witness in a previous trial in Detroit. I recollect that I kept an account, and I believe I stated so at Detroit. I stated that we measured the rails for a week at different times. I generally kept an account for a week, and then at the end of six or eight months would measure for another week. That is what I call keeping an account of the work done in a shop. And during the time that I kept the account, I think we did about twenty feet a day. I didn't see that they worked any harder when I kept an account than when I
63 didn't keep an account. I think the men did from twenty to twenty-five feet on the machine, working piece-work. The machine worked very well. I said that I did better work on the common block, because I saw it; very seldom had any difficulty in bending the neck of the rail down on a common block; on the common block used a hammer weighing about five pounds, and then used a sledge afterwards to smooth it off. We used the five-pound hammers to do the welding part, and a sledge to finish it off; sometimes used a fuller to set up the rail when it got mashed down; think the work was not done as well on the machine as on a common block.

Direct examination resumed:

Don't think they used the fuller much when they used the jaws; but it is amongst the tools connected with the blocks; sometimes they do use it on the end of the rail. It was my business, as foreman of the shop of the Northwestern railroad, to know what work the men did.

64 The defendant, to sustain the issue upon its part, then produced as a witness—

PORTER G. BARTON, who, being first duly sworn, testified in substance as follows:

I reside at Fitchburg, Mass.; have been in the business of repairing rails; I am not now; quit the business about two years ago. I worked for the Vermont & Massachusetts Railroad Company for eleven years, at Fitchburg, Worcester County, Mass. I used what is termed the "Whitney block." We used the block—that is, the material—in different ways. I found, when I first went there, the block the same it is

now. The rail was put in the jaws for welding, and the wedge driven up. The great trouble was to get the rail into the block soon enough; it cooled the iron so that it would not weld. I then welded it on a plain surface; that is to say, the rail was put on the smooth part of the block, and welded right along on the top, and then was turned over on the side, and put on that side, and put into the jaws and worked in
65 that way. We worked that some four or five years, but finally gave that up entirely, and welded on the plain surface-block with a swage for something like a year before I left there. We had occasion to move to another shop, and I then turned the block right over. We used the swage after the block was turned over; did the work just as well after turning over the block. The process of mending a rail is as follows: The rails, from eighteen to twenty-four feet long, are hung, by a crane overhead, very near the middle, so as to balance. We had two helpers; one standing at the further end of the rail, whose business it is simply to move that rail; another one is to do the striking. The rail is put into the fire, bottom side up, and heated red hot, and brought up, and with a chisel cut off perhaps half an inch. We then take what is called a fuller, and drive it up against the shoulder, caused by the scarfing, to set it up; we then fit a piece of iron, generally two and a half by three-eighths of an inch, then after that we put both the piece and the rail in the fire, the rail bottom side up, and heat to a
66 welding heat; the rail is then taken from the fire and laid upon the block; the foreman takes the iron and puts it on, and with his hammer strikes it, and his helper does the same thing; it is then turned over and welded on both sides; then finishes it off with a swage that fits along on the sides and top of the rail. I used the plain block always; put it on the top of the block; my custom always was to use two heats. I don't believe it would be possible, either in or out of the machine, to weld pieces on solid without taking two heats. I notice that all these rails here, with one exception (pointing to rails which had been mended), that there is not one piece that is put on solid. This shows the difficulty of welding in the jaws. A piece can be welded better on a plain block than it can be in the jaws; there is no question but that the jaws help to keep the iron in its place, but they are composed of such a mass of iron that it cools it. The piece must be probably welded within three or four seconds, or else it can't be welded at all. It is so thin that striking the jaw cools it instantly; whereas if
67 it didn't come in contact with any cold body, it would retain its heat a good while longer. In the manner that I have described, I took two heats on every piece, if it is only six or eight inches long; and I think that a fair average per day would be about twenty feet to heat; that is, to heat so as to weld soundly. In the manner that these specimens of mending are heated, I don't know but a man might heat forty or fifty feet a day; I think twenty feet is as much as ought to be done. To heat a weld soundly, it would make no difference whether a man used a machine or a plain block, assuming that he was to do good work. Whether a man could do more work on a machine with jaws, or upon a plain block, depends something upon the form of the rail. I have no question but that the jaws assist to keep the rail in its place. If the fish-bar is used, it makes more difference. If a common bar is used, I think I would sooner have a plain block. I used a plain block when I was working by the piece. There was no reason why I should not have used the jaws. I think the block was turned over, so
68 as to make a plain block of it, in the month of November, 1864; but I am not positive. It was used in that way until I left there

in August or September, 1865. I was there within a fortnight, and saw it used in the same manner. I know two years ago the plain blocks were used on the Rutland & Washington, and the Rutland & Burlington, the Cheshire, and the Vermont & Massachusetts roads; and the Fitchburg & Worcester, the Salem & Lowell, and one or two other roads that I am not willing to state positively about, I did know at that time. I know the witness who has been examined by the plaintiff, Peter A. Craig; I saw him here. I have seen him mending rails on a machine block. It was in the month of June, 1865, at Windsor, on the Canada side of the river, at Detroit. It was at the time of the trial of this patent at Detroit. The great fault in his work was in his welding. I heard him testify there, and took occasion to go over to the other side of the river and see him work. He put on a piece of iron very quick; that is, he put it on quicker than I thought it could be done well, and I don't
69 think the work was done as well as it ought to have been done. I don't know positively what it costs to mend on a plain block by the foot; that is a system of mending that I never heard of in the East. When I worked by the job I was paid so much per rail. Knowing the general character of the work, I took the risk of its being more or less. I was paid somewhere between thirty and forty cents per rail; that was from 1863 to 1865. The average per rail was something like fourteen or fifteen inches.

Cross-examination:

I was examined a year ago last June, at Detroit. I stated it took some little time to get the rail into and out of the machines. I don't know but that was the particular objection to that machine. I never worked with any other machine than that (pointing to the Whitney machine). I think there are other machines that it is easier to do it with. I would think the wedge caused no delay. I recollect testifying at Detroit
70 that it took some time to get the rail in between the jaws and turn the jaws up to the rail, and the rail cooled a little before that was completed. I think this an objection to all machines. I don't think the use of the wedge was an objection to the machine I used; I am sure of that. We used the machine, before turning it over, about ten years, as near as I can recollect. I might have said in my testimony before, that I kept on using it, as a great many other foolish people might, without finding out that it was much better to turn it over. It was ten years before I turned it over. I think the machine was virtually used just the same for more than five years. It didn't take ten years for me to find out that it was much better to turn the machine over. I didn't turn it over before, because I was to work at the same place, and one reason of turning it over was because I had more surface for my rail to rest on. I turned it over somewhere about eight months before the trial at Detroit. I hadn't heard of that suit before I turned it over; I am sure about that. I gave a deposition in the Detroit case previous
71 to the trial. No one directed me to turn the machine over. I am not positive that I turned the machine over in November preceding the trial. I am positive I turned it over before the first of January. I am not positive that it was in November. I am positive I turned it over before my deposition was taken. What fixes the time in my mind is, that there was a new shop built. I know that we were at work in that shop before the first of January; I don't know the precise time—within a week or a few days. I should be willing to swear positively that it was between the middle of October and the middle of December. I know there was a little snow on the ground. My recollection is about

the time of my deposition, that it was taken in the spring of 1865; I mean somewhere after January; I should say somewhere in March. We didn't use the jaws for some five years before we turned it over. We used it when we liked, but we didn't like it very often. My idea is that the hammer should be proportioned to the work to be done. I
72 prefer the welding hammer for patching rails. I think two heats with a light hammer are better than one with a heavy hammer. How heavy or how light a hammer is to be determined by experiment. The hammer that I used would weigh some three or four pounds. The hammer that the welder used weighed about seven pounds. I think that hammers of that weight are better to weld a piece upon a rail than hammers weighing fourteen pounds. I think the welding could be done better when the neck is not sustained than when it is sustained by the jaws. It never broke down with the hammers that I used. The neck will thicken up, or upset a little, invariably. I think this improves the rail, provided the chair which you use is a chair that simply fits on a flange. When I turned the machine over, I put the swage on the other side. I used a fuller in connection with it. I used it to bring the neck of the rail back to its original shape as far as possible. I used it
73 only on the end in order to make the chair fit on the end of the rail. I used the block turned over from the time it was turned over until the month of August or September following. I have not worked at the business since.

74 The defendant, to sustain the issue on its part, then produced as a witness—

HORATIO ANDERSON, who, being first duly sworn, testified in substance as follows:

I reside in Chicago; I am general master mechanic on the Northwestern railroad; they mend rails on that road; on the Wisconsin division we use the plain block; on the Galena division we use the Cawood block; on the plain block we mend from two to three hundred inches per day; I don't know of any more being done on the Cawood block; it averages about the same; my opportunities of knowing how much is accomplished are by the number of feet returned to me each month; work is done as well on the plain block as it is necessary to be done.

Cross-examination:

We use the plain block on the Wisconsin division here at Chicago, at Harvard, Janesville, Minnesota Junction, and Fon du Lac; we use two Cawood blocks at Turner Junction on the Galena division, and
75 two at Sterling; I think that is all we use; have no license to use the Cawood where we use the common block; I was foreman of the shop where the work was done on the common block; we put on from two to three hundred inches on a plain block or a Cawood block; I know they have returned to me about the same amount; I have seen from two to three hundred inches put on [on] a common block; I was foreman of a shop some two years where it was done right along in the shop; I have seen a piece ten inches long put on at one heat and finished up with a common fire; in doing this there is no necessity of bending down the neck; we used a light hammer for welding, weighing from three to four pounds; we used a fuller to get the neck back properly; we used it occasionally, not always—not as a general thing; if a man gets his rail a little too hot, it turns down a little, and we use a fuiler to set it up and get the rail back to its original hight; in case we overheat the rail we used a fuller, not otherwise; our workmeu are skilled in the business.

76 Direct-examination resumed:

In taking the heat the rail is turned out, and if the piece is not sufficient to bring it to the proper height, then you use the fuller to set it up to the proper height. There are some ten or twelve plain blocks in use on the Northwestern road; they are adding them all the while. If the heat is properly taken, it will not necessarily compress the neck.

The defendant, further to sustain the issue on its part, then produced as a witness—

SHAW STEWART, who, being first duly sworn, testified in substance as follows:

I reside in Chicago; am a blacksmith; work on the Illinois Central railroad; mend rails on that road; in the shops that I have charge of, we use a machine like this (pointing to the machine called the bayonet machine); we call it a bayonet machine for patching T rails; 77 that is the machine that we use (pointing to the original machine in court); we used it about eighteen months; we had no trouble with it; we have used several other kinds of machines with jaws; we have used the machine which we call the angle-iron machine (pointing to the actual machine then in court); in using that machine, we turne the eccentric around as far back as we can get it, and put in a rail between the jaws and squeeze it up; the roller on the side of the machine was used to guide it; it worked very well; we could not do quite as much work on it as on the other, because of the trouble in getting the rail in; the jaws were too close together, and the rail could not be dropped in from the top; that is all the trouble I found with it; we have used another kind of machine for quite a number of years, like this model (indicating the model of the machine in use in the shop of the defendant). I like the machine first described best, because I can mend two rails of different sizes upon it at the same time; I like the bayonet machine best, because I can mend two different-sized rails with 78 less trouble than upon any other kind of machine I ever saw, for the reason that I can take out the jaws which have been used for mending four-inch rails, and put in jaws to mend a three-and-a-half-inch rail. In the other machine there was no way to do this without using another machine; in none of these machines, as we use them, is there any bottom for the rail to rest; the rail does not rest on the bottom. We have used them in this way for about a year and a half. I had no trouble in working with the angle-iron machine at all without any bottom, (Witness here illustrated to the court how the jaws could be changed in the bayonet machine to suit rails of different heights.) We made the change by cutting out the bottoms of the machines, because we came to the conclusion that it would be better to take a piece out. We do, day by day, in the shops of the Illinois Central road about from eighteen to nineteen feet of rail-mending; that is a fair average of the rail- 79 mending done every day. In 1860 and '61 it cost, as near as I can get at it, about fifty-four cents per foot to mend rails; of course, it was cheaper then than now.

Cross-examination:

I suppose the machine which I have called the angle-iron machine is a machine for making angle iron; it goes by that name; I don't know whether it will make angle iron or not; I never tried it. It will hold a rail to be mended; it has been in our shops for some months; I first saw it used last week; I mended a rail with it; my business is to look

after the shops; we make frogs at the shops; my particular business is to build locomotives; I am in charge of the rail-repairing shop; I am sometimes in one shop and sometimes in another; I have charge of the two shops. Personally, I don't work upon these machines; I give the men their work, and see that it is done right. James Ryan is the name of the man that does the work on the machine which I call the bayonet machine. We have two machines like the Cawood machine, and
80 there is only one fire kept going. The fire kept going is on the west side of the shop. We use another machine for making frogs. We have not work enough for one fire all the time in mending rails. Sometimes we mend rails on one machine and sometimes on the other. We never mend rails except on one of the machines at one of the fires. We are making frogs all the time. The machine that we call the bayonet machine was so called when it first came into the shop about a year and a half ago, after the trial at Detroit. It was made at the works of the Illinois Central road; I don't know under whose direction. I have seen rails mended on that machine. The highest rail that we use on our road is four inches. We have about fifty miles of that kind of rail. It has been in use two or three years; some of it three or four years. The jaws are made so as to elevate the bottom of the rail above the block underneath; that was to prevent it from settling down. I believe that to remove that anvil from the bottom of the rail will prevent the rail from settling down.

81 Direct-examination resumed:

The bayonet machine was taken down ten or twelve days ago, in order to work with the angle-iron machine; that is the only reason. There is no occasion for the rail to rest on the bottom of the block at all. It is the crown and neck of the rail that needs to be supported. It is underneath the top table of the rail. The rail is held in the sides underneath the top table. The jaw held in that way is sufficient to resist the blow upon the top without any bottom.

The defendant, further to sustain the issue on its part, then produced as a witness—

JAMES RYAN, who, being first duly sworn, testified in substance as follows:

I live in Chicago, and work for the Illinois Central Railroad Company. I generally repair railroad bars and mend frogs. In mending railroad iron we generally use what we call the bayonet machine. We have used it about eighteen months; I and the helpers have worked on it. No fault was found with the work done on it, either in mending
82 rails or making frogs. That machine (pointing to the machine in court) is just the same as when I used it. There were other machines that we used. We used an angle-iron machine two or three days. They worked tolerably fair; only when we got a rail in, there was difficulty in getting it out. After we got the rail in we could do very well, except we could not exactly get tighten up, for the reason that there was not leverage enough. That is the angle-iron machine (pointing to the machine in court) as it was when we used it. The bottom of the rail didn't rest upon anything; it was half an inch from the anvil underneath. This Cawood machine (pointing to the full-sized working machine in court) is just the same as when I used it. I can't state how long exactly I worked it; may be four, or five, or six days. That rail didn't touch the bottom. It worked better if anything than it did before, when the rail did touch the bottom.

Cross-examination:

I worked for the Illinois Central about six or seven years. I had
83 charge of the fire in the shop where they repaired rails. I am foreman of a machine which is called a bayonet machine. Another man is foreman of the other machine. We have two fires and two machines—no more at present, nor have we had within two, or three, or four months. We have had more inside of a year. I am not certain about the bottom being out of the other machine; but when I worked myself for three or four days, I worked with the bottom out, with that identical machine (pointing to the one in court). There are two other machines like that in the shop; one for low rails and one for high rails. One is used for making frogs. I have never seen them repair rails upon it. We don't use those machines for repairing rails at the shop. In the machine in court (pointing to it) the rail don't rest on the bottom; it rests on the roller on the side (indicating the roller on the side of the angle-iron machine). The roller is a little higher than the anvil; is just as high as the jaw with the rail in it. I have repaired rails on that
84 angle-iron machine. I recollect taking a rail out of it which had been bent down in consequence of the bottom of the machine being lower than the bottom of the rail, and straightening it on the anvil. In that case I had to make the rail hot. It was too much projected on the side of the machine. In repairing a rail we only hammered on that part of it between the jaws. The hammering may cause it to bend down so that we will have to straighten it, but not very often. I have repaired rails on that machine when I have been obliged to take them out and straighten them on an anvil. The same thing never has occurred in the bayonet machine. We sometimes have rails so heated that their own weight will bend them down. It is very easy to straighten it when it does happen. Sometimes the rail gets a little too low, then we take a fuller and raise it up again; that is, when the man does not work just right. I don't know that there is any other Cawood machine in the shop than the one here in court that has the bottom out. I worked on this machine, and saw the bottom cut out.

85 Direct examination resumed:

There are three machines like this (indicating the Cawood machine) in the shop; one for high iron, and two for low iron. This one in court here has the bottom out. There is one other just like it that has not the bottom out. In the one for high iron the bottom is out. We have two machines in the shop, very nearly alike, for high iron, both of which have the bottom out. I said the rail rested on the roller in the angle-iron machine; but when the rail is in, and the jaws brought up, and the rail is pressed between them, it don't rest on anything at the bottom; it rests on the top. We only use the roller to help guide the rail in. The bending down of the rail, which I speak of, might happen if I got the rail a little too hot; the weight of the rail brings it down. No part of the rail held between the jaws settles down; it bends on the outside of the jaws by the weight only.

The defendant then offered and read in evidence the deposition
86 of seventeen witnesses taken in this case, whose testimony tended to show that the common swage-block was in general use for repairing railroad rails upon the roads in New England and in the Middle States, except where the fish-rail was used, in which case the jaws were used to keep the rail in shape and proper height; that in many cases various forms of blocks, with jaws for holding the rails whilst

undergoing repairs, had been tried, and, after trial, rejected as undesirable, and that no more and no better work could be done upon such blocks than upon the common swage-block; and that with the usual complement of men, from ten to fourteen feet of welding was done upon the common block.

87 The defendant then put in evidence a duly authenticated copy of the letters patent, and the specifications and drawings thereto attached, granted in England to William Church, in the year 1846, for a machine, therein called "A machine for stamping, flatening, and shaping metals," etc., as follows:

88 The defendant, further to sustain the issue on its part, then produced as a witness—

JOHN COOLEY, who, being first duly sworn, testified in substance as follows:

I reside at Springfield, Mass.; my business is forging bayonets. I worked about twelve years at forging bayonets at the armory at Springfield, Mass. The manner of forging bayonets is as follows: The blade part of the bayonets is made out of a piece of square steel, five-eights inches square, of the proper length. In the first place the neck is rounded in that shape, for instance (indicating by the model). It is then drawn out into a point; it is then put into swages under a trip-hammer, the plate being set down into a die (illustrated by the model), and after that it is bent over, and then it is put into one of the anvil-vises in this shape (indicating by model), and the blocks forming the jaws of the vice are brought up by means of a treadle, and hold it firm all around; then a hand hammer or a sledge is applied, and the projecting part rounded down. We then take a piece of iron, about two
89 inches square, holding it with tongs; the piece of iron and the steel for the bayonet are then heated to welding heat; the piece is then stuck on to the neck of the bayonet, so that it will hold. Then it is put into the fire again to get a proper heat, and then placed in this vice (indicating the bayonet-socket vice, model marked A 2), and put under a trip-hammer and welded; then it is put on a tool in an anvil shaped nearly like a U, and bent up, by blows on the top, into the shape of a U; the helpers then strike on the sides of the bent iron, bringing them nearly together, as shown in the model. The socket thus partially formed is then placed in the fire, and heated to a welding heat right around the top, where the edges of the plate come together; it is then put into a bayonet-socket vice, like the model A 3, which fits all around it closely. The helper, standing behind, drives in a pin or mandrill, and then the trip-hammer plays right on the top, and that welds the bayonet socket all firm and nice. That completes the hammering of the socket. The models here in court, and which I used
90 to illustrate my answers, correctly represen the actual vices as they are used in Springfield in the way described. They are correct in respect to the hight the jaws come up upon the sides; particularly the one with the representation of a trip-hammer attached. They also correctly represent the actual vices in respect to the support given to the under part of the socket. The hammer on the top of the vice is also correctly represented in the model, and it acts as a swage. These anvil vices have been in use in the Springfield armory since 1842; before that they used a clamp and common vice (illustrated by the model in court, marked B 1). They have used the trip-hammer for hammering successfully since 1845, I should think. The clamp and the

anvil vices kept the neck of the bayonet from spreading or being crowded down. They had to be kept in good shape, or they would be spoiled in making. The clamp or vice kept it in its right shape. They all have to be guaged exactly the same size. The fins, or projections, in the sides of the bayonet sockets have to be all in their right
91 places. I know how they manufacture gun-lock hammers at the Springfield armory. The anvil vice used for this purpose is very much like this model (referring to model in court, marked A 4); the iron is of that size (indicating the piece of iron marked B 2). It is broken down in what they call a jumper, and is hammered down into that shape, which gives it exactly the right size. Then it is put into the anvil vice, and pressed up between the jaws by means of a treaddle, which holds it firm. A chisel is inserted to split it down, and a set hammer put on, which bends over one part of the iron. During that process it is held firmly, so as to retain it exactly in this same shape. The metal of the hammer is worked heated. They all have to be the same guage. Anvil vices for making gun-lock hammers have been in use in the shops where I worked since 1850. The model in the court correctly represents the vice then used, in respect to the height of the jaws, and with reference to the work held in it.

92 Cross-examination:

For the last five years, nearly, I was assistant foreman in the armory; in 1852 and 1853 I was a workman; in 1842, or between '42 and '45, we began to adopt these new forges, or new kind of vices, of which I have spoken. In speaking of the old method of making bayonets by means of a common vice and a sort of sub-vice, within the jaws of which it is held, I refer to the common vice which has been in use a great many years, both in wood and in iron, and we inverted in it an instrument which is a sort of sub-vice, and what we called a clamp, and the bayonet was held in that way. The use of that was slow in comparison with the other method. I was examined at a previous trial. I should think the improved machinery made a difference of forty per cent. in the amount of work done, and consider it an important improvement. The vice here in court, and now referred to, is an actual working vice for the purpose of welding the socket of bayonets. It looks like one that
93 has been used for that purpose. In taking hold of the handle and pulling down the hammer, it springs back, and that is the case with all machines. The cam is never so arranged with reference to the jaw, that when the handle is drawn down it is held; that is, not permitted to be the working condition of the machine. It is worked by the foot, and is a treadle vice; that is what we called it down to 1853, and and] until within three years ago. In the models of the machine here, I observe that there is such a relation of the cam to the jaw, that when the jaw is closed it does not spring open. I don't recognize any difference in this respect between the actual machine and the models. The model is a wooden machine. The purpose of the machine is to put the bayonet socket into it and let it rest, for the purpose of welding the socket upon the top, which is exposed; and when it is welded it is like this (exhibiting the welded socket). The purpose of putting it there is to weld it together on the top; it then goes to the finisher after it is welded.
94 We ascertain that the parts have the right relation to each other by the guage. Every man has a guage. Before going to the finisher they are guaged to ascertain that the shank bears its right relation to the socket and the blade. If the relation is not right, and it can't be altered, it is condemned. We alter it if it can be done. There is no

machine for altering it. There is no way that I know of that we can do it; but we calculate to keep them in just that shape as near as they can be. They are all swaged after they come out of the vice. We have no hand-swage. We have a drop that swages the whole socket, shank and all. After it comes out from the vice in which it is welded, we have a swage which acts upon it, and operates both upon the shank and the socket, and they are all right if we can get them into that swage. We put them in there to reduce the size. The shank is not lengthened. The die is made of cast-steel, about six inches long; the operation of the swage is to upset it, and give to it the form of the die and swage. It has the form of the die and swage, which gives exactly the right
95 direction to the socket. After that swage operation, they go to the finisher.

Direct examination resumed:

By the cast-steel die referred to, I mean a plain surface in which there is a form cut out, and that form is one-half of the shank. The relation between the blade and the socket is exactly right, and this is measured by a guage. By a guage, I mean a piece of metal which is applied to it. If there is a half, or quarter, or an eighth, or a sixty-fourth part of an inch variation, the blade and the socket and the shank that have been taken from the forging machine will not fit into the die, and therefore, before the die can be used, the relation of the parts must be perfectly maintained. The object of putting the bayonet into the die is to get the proper shape. It can't be elongated in any way; all that can be done is to give proper shape to these projections on the bayonet socket. There is the same contrivance in the actual working of the machine to force open the jaws, as in the actual models.

96 The defendant, to further sustain the issue on its part, produced as a witness—

EDWARD GREENLEAF, who, being first duly sworn, testified in substance as follows:

I reside in Indianapolis; I am a machinist; in the year 1849, as near as I can recollect, I had something to do with making angle iron for locomotive frames in Cincinnati. The difficulty was, we couldn't make the piece in the form we wanted without new machinery. The proprietors of the establishment asked me if I could make such a machine. I told them I thought I could. They told me they thought it was worth making the experiment. I made a machine like this model (indicating a small model of angle-iron machine, marked B 3). The difficulty in making a piece in proper shape was that the common anvils formed it into a section of a circle, and it could not be got back without spoiling it, without these clamps. The question was whether I could make
97 something that would keep it straight while it was hammered, so that it would not get crooked in the making. In the other way we could not make a piece six or seven feet in length without making it three or four inches crooked. This machine that I made did away with all the difficulty in this respect. We make the angle iron out of two pieces of iron; one a bar about two inches square, and the other what is called a slab, six or seven inches in width, and perhaps an inch thick. We put the pieces into a common blacksmith's fire; after that we put them under a hammer, and run the hammer along the top so as to tack the two pieces together. We then put the two pieces in the fire, and place them in the jaws of the machine; one of the limbs resting between the jaws, and the other on the raised block between the jaws. One man

stood on one side and another on the other side, and as the hammer came down on it, the iron was moved along under the hammer, the cam at the side being loosend for that purpose. We would then turn it
98 over on to the other side of the machine, putting the other limb of iron between the jaws, and repeating the process. In this way we found the piece came out perfectly straight. When a piece was finished it was about two or three feet longer than when it was first put into the machine; it was then some six or seven feet, sometimes longer, depending upon the length of the first piece. It was then taken upon a common anvil and the ends scarfed or beveled; and several of these pieces so finished were then welded together, being placed between the jaws of the machine for that purpose, until the requisite length was atttained, which was some twenty feet. Three or four tons of iron were used up in trying to make this angle iron, before the machine was constructed. I never knew of a piece being lost after the machine was made. That model (indicating model of angle iron shown to the witness) is about the size of the angle iron; it is about as wide in this model as it is when it goes into the machine; when it comes out of the machine,
99 one side is about four and a half inches wide, and the other about three and a half. In the old way the difficulty was that it made a crooked piece of it, but by holding it with these clamps you could work it straight. They could not weld the ends of the pieces together half as well on a common anvil as in these clamps, because of the clamps holding it up to keep it straight while the welding is made. It holds it and keeps it in shape; that is, the whole principle of the machine was to keep the bar straight while we were working it. I staid there about a year and a half, and they used it all the time, and were working with it when I left. I never knew it to fail, and never heard of any complaint about it. The machine was made of cast-iron; the jaws and all except the handle were of cast-iron.

Cross-examination:

I remember being examined at Detroit as a witness. Our purpose was to make angle iron for locomotive frames. One of the pieces that were used for that purpose was about two inches square and about five
100 or six feet long. Five feet was the average length. We had another piece for the wider side of the angle iron, about like this (indicating the model in wood marked B 4). In the first place we welded these two pieces together slightly at each end; then we put them into the fire to get them to a welding heat—heated them together; and after the two pieces were welded together, we had a square corner on the top; and our purpose was in part to reduce the limbs in thickness and get the round fillet inside. A fillet was required there, and the great difficulty was before that the fillets were too large. Before the machine was made, an effort was made to form this iron under a steam-hammer and upon a flat anvil with a square corner. But whenever we undertook to do this the piece crowded off from the anvil; that was the difficulty; we took the fillet into consideration with the rest of the machinery; we didn't care particularly about that; that was considered an improvement in it. The round part in the corner is the fillet. We could not
101 make a fillet on a common anvil. We couldn't get it small enough; it made too large a fillet. We wanted a fillet, but we wanted it small. We wanted it to strengthen the iron; we made round corners on the anvil the first time we used it. I don't remember that on the trial at Detroit I said we could not make round corners without a clamp, but could make a sharp corner without it. I can't say now that the fillet

was indispensable; it is so long since. I should not have been called on to make this machine if we could have made these pieces square. It was considered an improvement in the machine that it made the fillet. I don't remember that at Detroit I swore that "in making angle iron by a machine like that would make it good for nothing; that it wouldn't be good enough for the purpose; that it wouldn't be a good article." It wouldn't be so good without a fillet. If the corner in that machine was square we wouldn't get any fillet. The corner would have been square; that was not what we wanted. It is so long since I testified at Detroit
102 that I can't positively remember what I said. I wish to say this: I don't think there was anything said by the proprietors about that fillet when the first order was made for this machine. I considered it an improvement. We put the iron into the machine to make a square corner outside and a fillet inside. It was the object of the machine to do this. The proprietors would have been content with a square corner; I don't know that I should. The square piece of iron forming one side of the angle iron was reduced from two inches to a half an inch in thickness; on the other side to five-sixteenths of an inch, or a little more, perhaps. Sometimes the length was increased two feet; sometimes less; sometimes more. When the process was completed, the piece which was an inch thick when we started had been reduced to five-eighths or three-fourths of an inch; and the piece which was two inches square had been brought down about five-eighths of an inch. In the process of hammering, the pieces sunk into each other, and by doing so formed a fillet in the corner. We had to take a thick piece of iron for one limb of
103 the angle iron, because a thin piece would have all been burnt up before the welding would have been completed. The square bar was sunk by the hammering pretty near half through the other piece. The two recesses on either side of the machine for letting in the limb of angle iron were just alike. Neither limb went down to the bottom of the recesses; they were not attached to the bottom. That was not considered indispensable. Every blow which was struck was a blow that made the piece wider and longer. It made the pieces on the top of the anvil longer. Of course that must be the effect of it. And it changed the figure of the piece as to the length and width that was between the jaws. The object of the clamp was to keep it straight. Every blow changed the figure of the piece between the jaws. The hammering was done upon the iron on the top of the anvil. The part between the jaws was never touched whilst between the jaws, but afterwards turned over and hammered wider on the other side of the anvil. With a square corner on the anvil we would have no fillet; but a square corner would soon wear off. It was sixteen or seventeen years ago that I made
104 the machine, and I was within a dozen yards of it for two years and a half. The jaws were made strong enough to hold the pieces of angle iron between them. That old anvil was just about the size of this model (indicating the big block model of the angle-iron machine marked B 5). As for the thickness of the jaws, I don't remember; I don't suppose that anything was out of proportion. Whether the movable jaw was three-fourths of an inch, or an inch and a half, or two inches, I don't remember.

Direct-examination resumed:

In respect to the rounding off of the corners, the model here represents the old machine exactly, except the corner is a little more rounded; it had a smaller corner than this model represents; otherwise, it looks just like the original machine. The old machine was used a year and a

half, to my certain knowledge. The model representing the full-sized angle-iron machine looks just like the original machine, including the jaws, just as it was used, excepting these corners.

105 The defendant, to further sustain the issue on its part, then produced as a witness—

FRANCIS C. TREADWELL, who, being first duly sworn, testified in substance as follows:

I am by profession a solicitor of patents. A portion of my time is occupied in the examination of patent cases, and in investigating mechanisms in these causes, and attending courts as an expert. For the last ten years I have been engaged in examining inventions and mechanics as applied to different useful arts, preparing specifications and applications for patents, and studying the working of a very large variety of ordinary manufacturing machinery connected with patents; and in the course of my preparation, to perform the duties of an expert in particular causes. I am acquainted with the construction of machinery and its operations generally. I have seen the vices in operation at Springfield; the anvil vices used in the manufacture of bayonets. I have seen the Beebe & Smith block in use, which is similar to the
106 Cawood block. I have seen the other blocks. I have seen the bayonet block in use, and have examined a large variety of models, etc., in this case. I was examined upon the trial at Detroit with regard to this same patent, on the part of the defendant. I have become familiar with the subject now before the court, and am acquainted with the models of the machine here presented. I have examined, and I believe I understand, the machinery described in the Cawood patent now in controversy. I was in court yesterday and heard the testimony of the witness Cooley in connection with the machinery and the models of the machinery used in Springfield in the manufacture of bayonets, and have seen the machine represented by the models in operation in Springfield. These models represent the machines I saw at Springfield. I have seen and examined the models of the angle-iron machine, and understand it.

I have read the patent and specifications of what is known as the Church machine, and examined the models, and believe I under-
107 stand them. The model "A A" represents, substantially, one form of construction described in the Church, English, patent. The model marked "B B" represents, substantially, another form of construction in the English patent. There are some minor omissions of details in these models, but those in the model "A A" are supplied in the plaintiffs' model of the machine now before the court, (marked C C). They are not exact representations in all respects, but they are substantial representations. In that machine, the steam-cylindars are represented as in the plaintiffs' model. The steam-cylindars here represented each operate upon a lever, and move the working jaws and the hammer. In the model "A A," the steam-cylindars are not represented. In the plaintiffs' model, the connection of the side levers which combine the two seats and levers on each side of the hammer are represented; and in the defendant's model "A A," they are not represented. In the plaintiffs' model the side levers which connect the two systems of levers which operate the jaws are represented; they
108 are not represented in the model "A A" of the defendants. In the plaintiffs' model the system of levers which actuate the working jaws are reversed, in order that they may both be combined with one

steam-cylindar. In the plaintiffs' there is a system of rollers and levers at the top of [of] the model connected with a bar and slings, or straps, intended to hold the mandrill used with this machine when bending up the tubular rail from the sheet metal. In the defendant's model this system of levers and slings is not shown; it is described in that patent as being used in that machine when the dies for bending up the rail are being used. This would not be necessary when the machine is used for welding the rail. The slings are merely a support of the mandril when the mandril is being used for bending around the metal. These differences I have spoken of are all the differences that I see, excepting that the defendant's model for the convenience of taking apart is made in sections, so that the upper part may be taken off from the lower part to get at the machine. The other differences that I have specified
109 I don't consider material as affecting the question with relation to the operation of the dies, whether they are operated at the same side or not by two separate instrumentalities, or whether connected by a lever to operate by one instrumentality. The machine "B B" is subject to the same differences that I have mentioned with regard to "A A." In the Church patent the operation of the jaw is connected with a steam-cylindar, bringing it down to its place as in the plaintiffs' model. There is no connecting mechanism. There is no substantial difference, as represented in the models, between the Church machine, having relation to what is described in the Church patent as straightening in the one case and welding in the other. In both are the jaws of the form of the rail to be held—to grasp and hold the rail—whether the rail is to be straightened, or whether it is to be welded; and in both there is a hammer which comes down over the top of the rail for the purpose of straightening and welding the rail. The two models represent different forms of the machinery described in the Church patent. There
110 is a fixed jaw in the one, and in the other both jaws are movable. The machine in which both jaws are movable is the [the] machine which is used as well for welding as for bending down the metal. In the use of the machine for making and welding tubular rail the plate of metal of which the rail is to be formed is first shaped by rolling it, or in some other way, as shown in figure twenty-five, attached to the Church specifications, and laid in a heated condition upon the bed which contains the mould upon the face of it similar to the form of the bottom of the rail to be bent. A die overhead and two other dies at the side together, by simultaneous movements, bend the rail into the form shown in figure twenty seven; the dies being marked "A," "B," "C," and "D." The prior figure, twenty-six, shows the intervening movement of position, or intervening positions, between figure twenty-five and twenty-seven. After it gets into the position of figure twenty-seven it is thrown into the position shown in figure 29; figure 28 displaying the inter-
111 mediate position of the parts in the machine.

In figure 29 the rail is represented as being formed around the mandril, which has all the time been held in the slings, at each end of the machine, represented here in figure 28 and 29, the mandril being introduced at the start, or at the time it was to go to figure 28. The mandril is within the rail, and the rail being bent around it, they are thus placed together in a furnace suitable for heating rails, so as to get a welding heat, to weld the top together. The rail is now formed—very rudely represented in this leaden model (referring to the leaden model of tubular rail marked B 6). The rail has been bent up, and the object is to weld these two parts together. When drawn out of the fire with the mandril, it is pushed into the dies of the machine "A A;"

and the dies being brought together they are pressed tightly, holding the rail. The steam-hammer or press is then drawn down upon it, and the weld is accomplished. The welding may be performed by hammering or solid pressure; it is frequently performed by hydraulic press-
112 ure. In respect to the other model, "B B," it is stated in the specifications that the top die or hammer is brought down upon the face of the rail or upon the top of the rail after it is placed within these jaws, and that it is held down by the top hammer. The side jaws are then brought up against it, or they may be used alternately. That is the statement of how the machine is to be used for straightening. The machine, having jaws fitted to the form of the rail, holds the rail whilst the top die is coming down upon it, or the top die holds it while the rail rests under the top die. The top die being described as holding the rail down while the jaws move up, I conclude that the jaws are to be a little lower than the top of the rail, otherwise they could not move up under the top hammer for the purpose of straightening the rail. The small model which I now hold in my hand, marked "X X," is an exact model from the drawings of the Cawood patent as close as I could have it made.

I believe it to be as near as it can be made practicably. As to
113 the different kinds of rails used, there is in the first place the strap rail—a flat piece of iron, perhaps half an inch thick or less, and fastened down upon wood sills. There is the bar-rail, which was used on the New York Central, and, perhaps, some other roads. I have seen it on the New York Central, on the sidings. I have seen them there within a couple of years—a rail like this model (referring to model marked C 1). That (referring to model marked C 2) is the form of the rail; that is a sort of angle-iron rail; it is a strap-rail that is put down upon a sill, with an angle at the side very similar to angle iron. Then there is the ordinary T rail, which has quite a number of different sections. In some the neck is quite parallel up to the table, while the table is almost cylindrical; while in some the necks widen very much below the table, and it is thicker below the table than in others. The double-headed rail is another form of rail similar to that (indicating the model marked C 3). It is something of the form of the Church rail. No one can tell which is the top of that rail. It is reversible.
114 Here is another form of rail (indicating model marked C 4); that is the U form of rail; it is a rail bent up from flat-plate metal, or rolled out from flat plate metal, hollowed in the middle, with a section in the form of a letter U. I have seen that rail on the Canada roads; I have seen a rail of this kind which had been mended in the Smith & Beebe machine, and saw the machine arranged for the mending of rails in this form. I don't know that I saw it in operation. There are other forms of rails. Here is a representation of a section of what is called the fish-belly rail, (indicating model marked C 5). The rail bellies down, as is represented in the model, at uniform distances apart. This rail is peculiar in this respect, that there is no parallelism between the top and bottom table. It would be impossible to shove that along between the jaws of the machine. That rail I have seen in use on the eastern railroads. Then there is a variety of form of the combined rail, similar to this model (indicating model marked C 6). It is made in two parts, so as to break
115 joints in the rails and make travelling smoother.

I have examined what is called the bayonet machine, produced from the shops of the defendant, and have observed the cross-section of the rail which that machine is intended to accommodate. That machine

is applicable for the purpose of mending rails of the different forms that I have described, without any material change. All you have to do is to make the jaws correspond with the rail to be mended. As I understand, if you were to put a flat-bar rail in the Cawood machine, under the directions of the patent, you would make the jaws perpendicular or straight, in order to grasp it. Here is an illustration of the Cawood machine adapted to bar-rails (indicating model marked D 1). This model has a fixed jaw, or block, and a movable jaw, and the only difference is this, the jaws are so fixed that the dies may be changed. The movable jaw is moved up to the rail by a cam.

It is a little lower than the top of the rail, and the only difference
116 between this machine and the other is in the shape of the dies.

It is a necessary difference in order to accommodate the shape of the rail. The two machines—the one exemplified by this model, and the other a practical machine, with the jaws to fit a T rail—have the same essential conditions. They, both of them, have a block, and fixed and movable jaws; both have a fixed jaw corresponding to the surface of the thing to be held. They both have a movable jaw with means of moving it up, with a fixed jaw to correspond with the movable jaw. Both have, what has been called here, the bottom, or something upon which to rest the bottom of the rail to maintain it against the blow, if necessary, in the operation of mending, or doing anything you please on the top of the rail. I consider that it would make no substantial difference in the machine, whether the jaw was changed to a square rail or to any of these forms of rail; or, in fact, to any other form of iron that was desired to be held in it to be operated upon by the smith. The only
117 change it would be necessary to make in the Cawood machine would be to change the surface of the jaws to the form of these different kinds of rail, and to make the rest proportionate to the rail, if in the Cawood machine it should be essential that the jaw should be lower than the side of the rail. The patentee says that he usually makes the jaw a little lower than the rail; therefore, following that rule of construction, the machine would only have to be made in a little different proportion for each hight of rail; and, of course, the jaw must be made to fit it whatever the surface is.

Turning now to the bayonet machine, the object to facilitate is the operation of forging, or welding iron in different forms, or in the forms shown in the machines. These are the different forms of the manufacture of the bayonet. The instrumentalities used to accomplish that object are a pair of jaws conforming to the shape of the articles which are held. One of these jaws is fixed, the other is movable, moving up to the fixed jaw. These jaws are combined together, and with a
118 mass of metal, and, together with their own weight, constitute the whole mass which is to resist the blows of the hammer, the bottom part and the shoe constituting the anvil. This mass is sufficiently large to withstand the blow of a trip-hammer in swaging, shaping, and forging the articles made on them. The special objects of the different parts of the machine are as follows: The jaws are separated; that is, there are two jaws, in order that the article to be operated upon may be enclosed between them; and it is enclosed between them for the purpose of protecting or maintaining the surface of the parts that have already been formed, and that are liable to be put out of shape by an operation such as forging. The jaws are made to fit the part to be held within them, and so conformed to the article held within as to present the part to be operated upon by the smith above the jaws. In the operation performed in this socket machine (referring to the bayonet socket

machine, marked A 3), the hammer or swage, which is a hammer
119 and swage combined in one, coming down upon the top with great force, welds the form to be welded and also gives shape, or determines or develops the shape of the socket, and the part must be exposed above the jaws to allow that to be done. The part which is exposed above the jaws is all that part of the socket above the centre, or the semi-diameter of the socket. In this machine it is necessary to hold the jaws tightly together. For that purpose a lever is provided having a roller upon it, which, acting upon the nearly perpendicular surface, acts somewhat like a cam. It is a substitute for a cams used in moving the jaws in the other machines; and for the purpose of holding down this lever there is a treadle upon which the operator places his foot. The same object would be accomplished if the handle was longer and heavier, and a weight put on the end of it; the holding down with the foot has no more effect than any other kind of weight upon it. The lower portion of the socket is sustained by a jaw; the part of it enclosed between the jaws is prevented from lateral expansion. The neck is prevented
120 from changing in its form and getting out of its proper relations to the socket while hot. The same object is accomplished in the Cawood machine, and by substantially the same means, and they are identical; the only difference being in mere form, and that a difference that is difficult to make tangible, from the fact that there is no special form described in the Cawood patent as being the form to which the machine is limited. In the Cawood machine there is a mass constituting the fixed and movable jaws and block which sustain the rail, or thing holding it against the blow of the hammer. In the bayonet machine there is the same thing. It is composed of fixed and movable jaws, and a shoe-block support. This sustains the article held against the blow of the hammer; the only difference in that respect being in the things which are held. In the Cawood machine the rail is to be of any form desired; or at least the jaw is to be fitted to the form of any rail which may be used, or that is being used, or that may hereafter be used.
121 In the bayonet machine the die may also be of any form required for anything to be held in it, no matter what it is. The form in this special machine (referring to the model of the bayonet-socket machine, marked A 3) is for the socket and shank of a bayonet. In others of the machines they are for other different portions of the bayonet; but the law of the construction of the machine, as developed in these different models, is that the form is to be adapted to the article held in the dies or jaws. That is the law of construction in this machine. The laws of construction of the Cawood machine is the same—that the shape of the jaws is to be adapted to the shape of the article to be held in it to be operated upon by the smith. And if one article or class of articles having a very large variety of forms happen to be called a rail, and another class called bayonets, hammers, cocks, or other names, it doesn't change the real and substantial purposes of these machines. There is another feature of the bayonet machine. In all the bayonet machines—the socket machine, the machine for heading up the shank, the machine for splitting, and then swaging down the hammer—in all these machines there is another rule of construction shown in the machines them-
122 selves; that is, that part to be operated upon by the smith must be above the top of the jaws, otherwise the smith could not operate upon them. That is the nature of these machines, and that, also, is the way that Cawood, in his specifications, says that his machine is to be made. There is another law in all these machines, that the thing is to be grasped between the jaws, as in the jaws of a vice, by molds conform-

ing to the shape of the thing to be held, so that by hammering or forging upon the top part of them, the form of the more delicate portions, which might be changed by the action of the smith's hammer, or trip-hammer in the Springfield machine, may remain unchanged. Indeed, that form in the socket machine is very much like that of a T rail, when you come to look at the section. For instance, the socket will answer for the upper table of the rail. The neck of the bayonet will answer for the neck of the rail. The wide portion of the bayonet below will answer for the foot of the rail. The same offices are performed by the different parts of these dies; that is, to hold, maintain, sustain, and
123 keep in shape the parts liable to be distorted and put out of shape by the operation of the smith that is necessarily performed upon the part which is exposed. In this bayonet machine (referring to the model of the bayonet-socket machine, marked A 3), the parts being made of wood, and springing as they do, it is possible to force this lever down too low. In the solid iron machine this lever is not, in practice, forced by—it is held down by the feet; it might be held down by the weight of the lever itself, as in the large machine (referring to the full-sized rail machine, made after the pattern of the Springfield machine). In the bayonet machine, the substitution of a pair of jaws that would fit the rail would carry out the law of construction in those machines. I also consider that you would be authorized to make the jaws lower than the top of the rail, and the analogy is very close in the socket machine. It is the thing itself. Here you see even the crowning shape assuming somewhat the form of the rail; that is the
124 exterior, or the place that is above the jaws to be operated upon. I don't consider that the Cawood machine is limited to any special size. If it were as wide as the rail is long, or as narrow as the bayonet machine; if it were large enough to take in these wrought-iron girder beams, which are similar in form to a T rail, and can hardly be distinguished in form from it; or if it were so small as to take in the little rails, it would be the same, in my opinion; I am talking about the machine. The model now shown me (referring to the model marked A 2) is the bayonet machine with rail jaws; the large machine referred to by defendant's witnesses as being a machine in use in the defendant's shops, is a practical machine. The one I have above referred to (marked A 2) is a model. What I was about to say is, I wouldn't consider the Cawood machine substantially different if it were made so much larger than the present Cawood machine as to be capable of taking in larger articles, or whether it was made small enough to take in this small rail,
125 (indicating model marked C 7), which is larger than I have seen used for the purpose of running muleys, or spinning machines. The jaws of this bayonet machine are made so that the dies can be fitted into them and taken out. When one set of dies is worn out another is put in their place; or you can exchange these for another set of dies of different form. For instance, one might take out the dies for a bayonet and put in the dies adapted for a small rail. The law of construction would be the same; it would be simply changing the dies of the machine. The large-size machine, the full-size iron machine now shown, constructed for mending rails, and which has been termed by the defendant's witnesses the "bayonet machine," is, in substance, the same as the Springfield machine; the only differences being mere formal differences—differences of size and weight. The jaws are not adapted to the holding of the bayonet as the machine now stands, though they happened to be adapted to the form of the rail. If jaws were put into that machine
126 with moulds in them adapted to hold the bayonet, it would hold

the bayonet, and the bayonet could be worked upon it as well as upon these vices, except that it would be somewhat more convenient to have a smaller vice. The same law of construction—that is, making the jaws hold the parts to be sustained in shape—is to be found in this machine as in the others. The jaws, or at least the parts which are formed in the jaws of these machines, are correspondent in shape with the different things to be put into the machine. The lever in the machine, instead of being held down by the foot, is merely held down by its own weight, so as to carry up the jaws to the rail; but that I do not regard as a substantial difference, unless the controversy should happen to be about the manner of holding the jaws together, which I suppose it is not. But the masses of iron with dies cut in their faces, now shown me, are intended, I suppose from their appearance, to fit into this rail machine, the dies fitting the forms of the bayonet.

There is another correspondence between the Cawood machine
127 and the bayonet machine; that is, in the Cawood machine the jaw is represented as having guides to guide it up. It is not material, in my estimation, what kind of guides they are, so long as they are guides properly. In these bayonet machines there are guides upon the sides of the movable block, which, of course, guide it up to the fixed block. In the Cawood machine they are beveled guides. In this bayonet machine they are flat guides. Comparing the large bayonet machine, constructed for mending rails, with the actual Springfield bayonet machine, the only difference that I can see in the two is, in the difference in the name of the thing they hold; they are both of them made with jaws; both of them hold the article in the same way; and by the same law of construction. The difference in size affects in no way the means of accomplishing their respective objects in principle, or mode, or operation. I can find no difference in the law of construction, mode of operation, or in the result, or effect. The only difference is in the
128 name of the article of iron to be held in the machine. The principle and mode of operation of the machine is not at all affected by the shape of the jaws. It is the principle of the machine that the jaws shall be required to hold whatever is to be operated upon in it. Regarding the object of the Cawood machine, and the bayonet machine, and looking at the two machines in the aggregate, I find them substantially the same machines; they are of the same family; they are more than analogous; the bayonet machine is substantially the same as the Cawood machine. I regard the machine described in the patent and the bayonet machine as substantially the same, leaving out the corrugated top surface of the block, which is commonly called the swage-block—leaving out that consideration.

I understand what has here been denominated the angle-iron machine. The object which it is to facilitate is the operation upon bars of metal. The means of accomplishing it are, in a general way, an anvil vice; that is, a vise consisting of a block of sufficient weight, for the pur-
129 pose of resisting the blows of a hammer, the blocks being composed of a fixed and movable jaw. In the angle-iron machine there are two movable jaws moving against the central or fixed jaw raised over the other surface of the block. These jaws have a guide which guide them as they move up towards the fixed block. The movable jaws are also provided with a cam to move them up towards the fixed block. The surfaces of the movable jaw and the fixed jaw are adapted to hold what has been called here a piece of angle iron while the operation of welding is going on—to hold this piece of angle iron while the operation of welding is being performed upon it. For convenience

while testifying, we will use the small model (marked XX). In the use of this machine any bar—that is, any bar that is of suitable size to be used in it—may be placed between the jaws, and held as between the jaws of a vice, and the part to be operated upon may be above the top of the jaws. The fixed jaw, or block, will resist the blow of a hammer,
130 the part being held between the fixed and movable jaws being prevented from distortion—from a change of shape—by being held as in the jaws of a vice. As I said before with reference to the bayonet machine, looking at this machine simply as a machine, irrespective of its use or of any special shape of the metal it contains, it contains an anvil vice; it contains movable and fixed jaws; it contains jaws of a given form, and the jaws of that given form are adapted to embrace any plain material and to hold it tightly. Here is also in this machine the bottom anvil, on which any article placed in the machine, if the article is big enough, may rest. I consider the machine substantially the same as the Cawood machine, for the following reasons: Generally, they are both anvil vices, and both adapted to hold and preserve the shape of the article held, and present the part to be operated upon. I don't consider the Cawood machine, as described in the specifications, as limited to any shape of the jaws; it may be of any form of construction of jaws that is
131 adapted to receive and hold any article that can be placed within it. In the angle-iron machine, the thing to be held may be supported by the bottom of the block and projected above the top, if it only happens to be of a hight to do so. If the article to be held in the Cawood machine is not higher than the jaws, it will not project above the jaws; neither will it in the angle-iron machine. Looking at them as machines no one can tell whether the hight of the jaw is sufficient, or, at least, whether the hight of the jaw is lower than the hight of the thing which is to be held, unless you have the hight of that thing. For instance, in the Cawood machine, if you were to go from a jaw suitable to hold a four-inch rail, down to a jaw suitable to hold a square-block rail, you would have to make the jaw a great deal lower in order to give the square-block rail a projection above the jaws; and as I don't consider the form of the jaws in the Cawood machine material, I consider that the two machines are substantially the same. In respect to the machine before me, referred to by the defendant's witnesses as
132 having the bottom cut out, I will say, the terms "cut out" merely conveyed to me the fact that the bottom was made so much lower that the bottom of the rail didn't touch it. The bottom is in this machine, but the jaw having a curvilinear form prevents the rail from dropping to the bottom, unless the bottom goes to the right place. These machines all have a bottom, but the bottom is a little lower than the bottom of the rail. I can't (looking at the machine) tell whether it is lower than the rail, without I can see the rail that is to be put in it. In the operation of the angle-iron machine as testified to by Mr. Greenleaf, if I correctly understood him, the iron didn't touch the bottom of the recesses; and, therefore, in the use of the machine with such a given piece of metal—angle-iron metal—in it, of that size, it would correspond with the use of the defendant's machines, which have had the bottoms lowered so as not to touch the bottom of the rail. If the rail was deeper in the one case, it would touch the bottom; and if the pieces which were to be put
133 into the angle-iron machine be of sufficient depth, they would also touch the bottom. Comparing the full-sized model of the angle-iron machine with the machines called by the defendant's witnesses the "angle-iron machines," having in it jaws fitted to the sides of the rail, I don't find any difference in the two in respect to the object to

be accomplished, and the means of accomplishing it. They both are for the purpose of holding the bar of metal between them while heated, to prevent sections of it from being changed by the operation of forging, hammering, or any other operation of the smith. The fact that the jaw has a change of form in the one, or that one form of jaw is different from the other, is not material in my view of the case. The law of the machine is, that the jaw should be shaped to the form of the article to be held. In the angle-iron machine, that which prevents the fillet from being made too large, is the movable jaw which comes up and holds the limb that is within the machine, when the upper limb is being ham-
134 mered upon, right up to the corner of the jaw; and this and the fixed jaw prevent the distortion of the shape of the iron. It has that effect in making that especial iron. In welding the two pieces endwise together, it has the same effect of all the other machines. In the Cawood machine this jaw, being pressed up against the rail, being of the form of a rail, prevents the upper table from being driven down, and prevents the neck of the rail from being distorted. The means of preventing the distortion in the angle-iron machine, and the means of preventing this distortion in the Cawood machine, do not differ at all. They consist in the surface of the jaws, held together by a cam, or any suitable means. These jaws, pressed up against and enclosing the metal, prevent it from changing its form, and allow the part that is to be operated upon to be changed. It is the same in both machines. If the Cawood machine was made to fit a square rail, it would be the same as an angle-iron machine. I observe in the angle-iron machine, that the jaws hadn't the same extent of motion as the jaws in the Cawood
135 machine; that is, it don't move quite as far. I don't consider that a substantial difference in the machine, whether the jaw moves a lesser or a greater distance, so long as it moves far enough to accomplish the work to be done in the machine. The only difference in applying the angle-iron machine to railroad purposes and a practical Cawood machine is, that this jaw moves back a little further so as to let the rail drop in. If the Cawood machine were made so that the jaw went back only far enough so as to let the rail in endwise, it would still correspond to the description in the patent, although it would not be the best way to make it. Taking the Cawood machine and the angle-iron machine, and looking to the objects to be accomplished, I see no difference between them as machines. The only difference is in the mere form of construction, and the mere form of jaw. They contain the same jaws. In the Cawood machine I have observed the cams throw back the jaws as well as move them ahead. If the machine is limited to the use of a cam, as the means of drawing back as well as mov-
136 ing forward the movable jaw, then, in this respect, it differs from the angle-iron machine. The angle-iron machine has no means of drawing back the movable jaw. It must be moved back by hand. The angle-iron machine, of which I have been speaking, is the same in principle and mode of operation, substantially, as that of the patentee.

In one of the Church machines the object is to assist the blacksmith in straightening solid iron. That represented by model "B B," I think, is represented in the patent as a machine for straightening railroad bars. The other, figure 13, shows a section of that machine. There is shown in that drawing a head. That stationary jaw is constructed so as to make it hold the rail—to conform to the side of the rail. Opposite to it, [is] another jaw of the same form, conforming to the other side of the rail, is represented, marked "A," which is shown in sections, as well as the rest of the drawing. The description in this patent, referring to

these drawings, states the way that straightening is performed
137 in this machine. The rail is placed on a bed; bring the hammer B upon it by levers controlled by the engine, and then move up the side jaws against it for the purpose of straightening it in that direction. This could not be done unless the side jaws were a little lower than the top of the rail; because, if the top die is brought down upon the top of the rail, and it is clamped between them and the bottom of the bed, these side dies could not move up unless they were just a little lower than the top of the rail; it would be utterly impossible. In saying this, I am explaining the operation of the machine, as represented in the drawing and described in the specifications, aided by my own intelligence in comprehending what is therein described. To refer to the parts of the patent which describe that machine, begin at line 18, page 5, of the specifications, commencing with the words "figure 12 is a plain, horizontal view of the machine for restoring, flattening, and straightening horizontal bars. The small figure 13 refers to the
138 same." The description then goes on to state in substance what I have stated in regard to that machine. The cross section of a tubular rail there represented is that of a double-headed rail; and the description says the machine is designed for straightening rails generally. A solid rail is a double-headed rail; and so is a tubular rail. The Church machine is a machine to hold an article under the operation of a smith, performed upon it to straighten it, by striking upon it. The operation of straightening is a branch of the blacksmith's art, as well as the mending of rails by welding the upper surface. I should consider the machine substantially the same, whether it was as long as the rail, or shorter. The solid rail in the Church machine is represented in that machine where the action is single; and with reference to it the specifications say it is designed, amongst other things, to straighten railway bars. In the drawings, the upper surface of the compressing jaws is represented as exactly on a line with the top of the rail, and the top of the rail is represented as very flat—much flatter than the ordinary
139 rail. But taking into view the directions of the patent regarding the operations of the machine; that is, that the upper die is to come down upon the rail to hold it, while the other one comes up to it to strike it. If these specifications were put into my hands, in order to make a machine fit for the operation, I would be obliged to make the side die a little lower than the top of the rail, in order to have the machine operate as described. This form may be used for another purpose. In this machine, represented by figure 4, we have a section of this machine with a double-acting jaw. So there is an upper and side jaw, which acts upon the side of the rail. It is lower than the top of the rail when it ceases to act upon the side of the rail; so it is in that machine. In principle and mode of operation the Church machine and angle-iron machine and the bayonet machine and the Cawood machine are all substantially identical. The Church machine has a more complicated superstructure; that is, the upper portion represented
140 in that machine. So taking the bayonet machine with its superstructure, the trip-hammer, and means for operating it, and it is a good deal complicated; but when you strip away the trip-hammer, and the means of moving the hammer, there is left the Springfield vice. The very same structure, and it looks like, and is in point of fact, the same as the Cawood machine. Take off the top of the Church machine, which has a trip-hammer, or a steam-hammer, and then you will have a simple bed, as exhibited by these block models (referring to models marked, respectively, A A and B B). Now, whether that bed

shall be longer or shorter, it will still be the same machine described in the Church patent. Drawing in or stretching out would make no difference in the machine. Therefore, in speaking of that machine as being substantially the same as the Cawood machine, I leave out of view that trip-hammer for welding and straightening, and consider it the same as if it were a machine with compressed, movable, and fixed jaws, combined with an anvil, and with the means of moving
141 the movable jaw up, and holding it fast, for welding, or for any other purpose. In considering these machines, I must separate them from their uses; although the uses of a machine are useful in tracing out their operation, and the analysis of their mode of operation. So far as supporting the article, or parts of the article, to be operated upon, the Church machine and the Cawood machine are identical. There is no difference in the machine in respect to these two things—the welding of the thing, and pressing the part to be operated upon to maintain the figure of the article held. The only difference is in the use of these machines, and, perhaps, some of the purposes for which they are used.

Cross-examination:

I said in my direct examination that the law of construction of these machines was to preserve by means of movable jaws the articles to be held, to preserve its form while forging, and to hold it in such a manner as to enable it to be acted upon by the blacksmith, which involves
142 something more than mere jaws. Considering the bayonet machine in reference to its functions, it is not material that its weight is not sufficient for practical use as a rail-mending machine. The comparison I have made is a comparison to show the functions and operations of the machines. Whether it shall be heavier or lighter depends upon the things to be operated upon; the machines are operated alike. The form of the jaws is immaterial so long as the form is capable of being used for some useful purpose. I don't think that (referring to model marked "common vice") would be an anvil-vice with its present construction. If you were to make it heavy enough for the purpose of an anvil, and use a hammer upon it as an anvil, it would become converted into an anvil for that purpose. I don't think that a vice made like that, made as heavy as an anvil-vice, would be substantially the same, comparing them with a view to their functions, as I have compared these several machines. If it were made as heavy as the Springfield
143 anvil, it would not be condensed in such form as to make an efficient anvil for the purpose of a Springfield anvil-vice. The model would be the same, but it would not present sufficient inertia; at all events, it would not be equal to it. I think there is a difference between that vice and the anvil-vice, irrespective of form, seize, and weight. That vice is constructed to be attached to something. The object of the construction of this vice is not to rest it upon a solid bed, so that it may withstand a blow from above, but to be fixed to something for a support, as a common work-bench, and is fastened for the purpose of holding something, not to resist heavy blows. At the same time, if you get a vice of this kind sufficiently large, it may answer as an expedient at times in place of an anvil. I have seen small anvils in locksmithing and other trades, taken out of the racks and introduced between the jaws of a vice like this, for the purpose of getting a smooth surface to hammer upon, being large enough for the work to be
144 done. The vice being so much heavier, it was sufficient to supply the inertia. I remember seeing this identical model of the common vice at Detroit. I remember of saying in my cross-examination at

Detroit, that "I don't think a screw is as good as a cam." I don't recollect saying at Detroit, "I think if this vice were made heavy enough it would be an anvil vice. It is not a railroad-iron mending machine; while if the machine was made heavy enough, it would be an anvil-vice, but I don't see any difference between these anvil-bayonet machines and a common vice, except that it is heavier." I think there is a difference between these vices and the bayonet machines, and I will explain to you how I get at what the difference is, in its function and mode of operation, and its weight and form, if you care to hear the explanation. (Explanation declined by plaintiffs' counsel.) I regard the bayonet machines, the angle-iron machines, and the Church machines as substantially the same as the Cawood machine in the parts that I have spoken of. They are the same in respect of functions, of jaws, and their having
145 an anvil with fixed jaws, and with surfaces to hold the form. They all have jaws which conform to the article to be held within them, and all have the law of construction of holding the article in the jaws to preserve its form while being operated upon.

Q. Do you find the Church machine as described, the bayonet machine as represented in the model, and the angle-iron machine as represented in the model, substantially the same in their structure and mode of operation as the Cawood machine?

A. The question is liable to misconstruction for this reason: I find in the Church machine a number of machines for the purposes which I don't find Cawood machine; but, nevertheless, I find in the Church machine all that I do find in the Cawood machine. Of course, when I reverse the comparison the machine contains more. My idea is this, that if I take away from that structure before me (referring to model of Springfield bayonet machine, marked A 3) the trip-hammer, and
146 other parts, which are independent of the bayonet vice, I still have the vice there. In the respects that I have mentioned, I find the Church machine as described, the bayonet machine as illustrated by the models, and the angle-iron machine, the same in principle and mode of operation as the Cawood machine. I mean in respect to the dies conforming to the shape of the article to be held, and having a fixed and movable jaw, and in its having the means whereby the movable jaw is moved up to the fixed jaw to hold the article to be operated upon. In this respect it is substantially the same as the Cawood machine. I have stated that I found in these several machines jaws, which not only held the article to be operated upon, but preserved its figure—the section of the figure which is held within the [the] jaws—in shape. That is the rule of the machines. I don't know that in the angle-iron machine its mode of operation is such that every time a blow
147 of the hammer falls upon the article to be operated upon, the figure of the article between the jaws is changed. I heard Mr. Greenleaf's testimony. I heard a question asked with reference to the effect of a blow of a hammer in lengthening or widening the part held between the jaws. I don't recollect his answer. My view of the operation is this, when you strike a blow upon that iron exposed in the angle-iron machine, you expand that part and change the shape of it; but the part in the jaws don't change in shape. When you turn it over and strike a blow upon the other side, you change the shape of the part you strike, but don't change the part on the other side. The top, which is capable of expansion, I think is expanded by the blow. It diminishes in thickness, and this operation forms also the fillet. The hammering process forms the fillet. Mr. Greenleaf describes his operation going on under the blows of a steam-hammer which is moved rapidly. He

describes a man as constantly setting up and throwing back the
148 cams so as to change the part operated upon. Now, in such a process as that, where the parts were changed in form repeatedly, it was not necessary to hold it quite so tight, perhaps, as it would be when you didn't have to change it at all; for it is constantly thrown backwards and forwards. I understood Mr. Greenleaf in his direct examination to say that the piece that was the wider one first went into the anvil. I remember saying at Detroit that "all these machines have dies made to put in different articles to be welded—the principle of the whole of them is to hold the part that is to be preserved, and to expose the part to be operated upon. They are all of one class of machines; there is no difference in the principle of them, and I don't consider it a substantial difference to go from the rail to the bayonet, or anything else." I don't include the common vice in this shape, in that generalization. I say of the common vice that it may be used as an expedient. I consider that

the anvil-vice is a different machine from the common vice, and
149 the step was taken through this clamp (indicating the model of hand-clamp, marked B½). Here we have a clamp which, composed of iron, is of considerable weight, used to form a covering for the thing that is put into the vice and held, and it was an expedient for adopting the old bench-vice to the use of holding and forging. I do consider that this was a step between the vice and the anvil-vice, and the advance was taken through this step. Here was an expedient for holding and pressing the article. Going further and consolidating a figure like this (referring to the clamp), and bringing it into and consolidating it with the anvil was another step which terminated in the anvil-vice, which is clearly distinguishable from the common bench-vice, although it is difficult to get a form of expression for it. I don't consider the vice & this hand-clamp, in substance, the anvil-vice; that is, it is not

a complete machine. It is not organized as a machine; but
150 when it gets into that shape (referring to the anvil-vice), I consider it a machine, having gone through the process of organization, and arrived at its completion. I don't consider it as involving a material and substantial change in the old vice to cut slots, or to cut a half circle for the purpose of running an article into it, because I have seen it done very often in such vices as these. I do consider that in looking at machines and their functions it is well to get an insight into what they are designed to do, and what each does do in its operation. I don't find in the Church patent any instructions to remove the top as I find it removed from the defendant's models. The machine as described has this top swage or hammer upon it. This top swage is described in the description of the machine. There is no other arrangement for the two purposes of forming and welding a rail. The machine described for the purpose of forming a rail is a machine which describes the operation of three press-blocks moving and co-operating

together, one from the top and one from each side, and also a
151 stationary one at the bottom. The top and side jaws are movable, and they co-operate with the one at the bottom. They operate and move together by the same steam-power. They are not necessarily operated by the same steam-engine. The jaws may move at different times and at different speeds, although the steam is taken from the same boiler. You might take steam to move one jaw from one boiler, and the steam to move the other from another boiler. The movements of the jaws depends upon the man that turns the cock. I don't find any instructions in the specifications that one of these swages is to move faster, when it does move, than either of the others. There are

no instructions upon that subject; you can move them faster or slower. You can, if you choose, move the two side swages with the same rapidity that you move the top swage. I call the top swage a hammer without calling the side swages hammers; because, in the operation of this machine, these sides are to draw the dies together and hold the thing, an operation which is done with considerable slowness. Throwing down the hammer may be done as rapidly as you please. If you were
152 to throw the side dies hard together, of course they would hammer upon the sides, and you could do that; the side dies are to hold the thing against the mandrill; you may move them up rapidly, if you like, and you may move the top one rapidly or slowly. The specifications don't say whether the machine for straightening the rails is to straighten one that is bent sidewise, or which is crooked upwards or downwards. I never saw a rail straightened in that machine. I never saw a machine like that in use. I have never seen a machine constructed in all respects like that machine; that is, with all the parts in. If you take the whole machine, I never have seen a machine constructed for the purpose of straightening rails substantially like that machine; but the same combination of fixed and movable jaws I have seen. The red mark, or A (referring to the drawing attached to the Church patent), I suppose to be the rail when straightened. The figure shows it to be exactly as high as the jaws upon either side. I don't mean to say that there are identical words in
153 this patent which assert that the side jaw is to be a little lower than the top of the rail. I see that it describes this construction and action of the machine which I have stated in my direct examination. I see that it describes this construction and action of the machine; and that in operation the fixed die, with the rail bearing against it, must be a little lower than the top of the rail. It is not material that it should be much lower; it should be a little lower. Supposing the end of a rail, exposed by the section shown in the drawing, to be much exfoliated, and a piece has been welded on the end, the surplus material, if there was any, would gush out sideways. So it is in the Cawood machine; it would be hammered out by the flat swage; the hammer would not come down so low, and a little fin would come out each side. It would permit the hammer to come down except for the thickness of the fin that would lie on the side. This would not leave the rail in a state of parallism between the part not mended and the part repaired. You would have to put in a little swage to swage it down. I should think this
154 could be done in that machine. The cost of this Church machine would depend upon how much you would extend it. It might cost ten thousand dollars in war times. But it would be an expensive machine to construct as large as it is described. I don't know that a machine, constructed like a Church machine, would be worthless for the purpose of repairing rails, but I don't think it would be the best way to do it. I think it could be done in the machine; it is practicable to do it. I don't think it a practicable machine for that purpose, with the top on it, and of the great length which it has. I think the T rail had acquired a pretty good ascendency by 1853; although there were a good many forms of fish-belly rail, I know it was largely in use. I saw it on the eastern railroads myself. I have seen it since then. The snake-head rail was not the common bar; it was the strap rail. It had disappeared substantially on the main roads of travel by that time. It was a dangerous rail, but a great many lives have been carried through on
155 it. The square-bar rail, I heard, was laid upon practical railways—on the New York Central. I didn't see it there; I saw it upon

the sidings of the road. I don't gather from the specifications of the Cawood patent that it is an improvement upon the swage-block. You may say that it is an improvement upon the old anvil. It is stated to be an improvement in repairing railway bars, in the title—"I have invented a new and useful improvement on the common anvil or swage-block for the purpose of welding up and reforming the ends of railroad rails." I don't know, as a man acquainted with machinery somewhat, that the real purpose of that machine was to operate upon rails not of regular form—not of square form—which required support, because there is here in the specifications a statement that the jaws are "for the purpose of pressing between them a T or otherwise shaped rail." I understand "otherwise" to include all shapes of rail different from the T rail, or not similar to the T rail; therefore I don't understand that it is to be similar to the T rail.

156 The defendant, further to sustain the issue on its part, then produced as a witness—

WILLIAM C. HIBBARD, who, being first duly sworn, testified in substance as follows:

My present occupation is that of a mechanical engineer. I have been all my life—all the active part of it—engaged in superintending the construction of machinery, and for the last fifteen or eighteen years given considerable attention to the construction of machines with reference to similarities and differences, and acted as an expert in courts. I previously attended the trial of a case at Detroit involving the same subject-matter as this, and, in connection with it, had occasion to examine several models that I see here, and of making myself acquainted with the subject. The larger part of my business has been active engagement building machinery, designing and planning it. For seven years, ending about six years since, I was engineer of the Atlantic Works, for building marine
157 and stationary engines, at the East. I was engineer of the concern. My business was to design and direct the construction of the machinery built there. Without being a practical blacksmith, my knowledge of the business of blacksmithing is derived from seeing the operations of blacksmith shops and the construction of machinery. I have examined, and I think I understand what is described in the Cawood patent now in controversy. I have seen the machine several times, and think I have seen rails mended in it. I never saw the Springfield bayonet machines in operation. I only know from the models and the description given by Mr. Cooley. I have examined the model of the angle-iron machine, so-called, now in court, and think I understand its operation and the object to be accomplished. From an examination of the machine alone you could not accurately infer what a person was to do with it; that is, whether it was to forge down iron in it, weld iron in it, or hold it in shape after it was welded. The machine is capa-
158 ble of all these uses; therefore, from the machine alone, I would not be able to distinguish which of them it is intended for. I read that part of the specifications of what is known as the Church patent which relates to the machine for forging upon railroad bars, and other similar bars—both forming them and straightening them—and have examined the drawings. So far as I can see, the plaintiffs' model of the Church machine, and the defendant's model of the same machine are correct representations of the drawings attached to the patent. So far as the form of the jaws are concerned, I don't see any difference between the models. The plaintiffs' model seems to be a model of the

entire structure, and the black model, or the defendant's model, seems to be a model of part of the structure, including more especially that which has reference to the form and operation of the dies between which the rail is enclosed when it is operated upon. The black models for this purpose represent fairly the descriptions, drawings, and specifications. The small model marked X X represents, substantially, I think, the
159 Cawood machine described in the Cawood patent.

Taking up the different forms of rail in their chronological order, the first rail, I think, was the strap, and then the tram, which had a flange for the wheel. Then came the single T, which had the upper table of the rail and the web vertical, and no lower flange. Then that was modified into what was called the fish-belly; it had the lower part of it cut into sections of enlargement that is intended to be between the sleepers, and made deeper in the middle. Then the next which came up was the double T or H rail, such as is in general use in this country. Before that was used the strap rail of different widths—that is, the square bar—which may have rested upon timber held down by bolts. Then the double H came in different proportions. Each engineer ordered his rails, having a particular fancy pattern, but having the same general character of a table or head at the top, and broad flange at the bottom, connected by a vertical web of some form or other. There are U
160 rails like these, which were used, I think, on the Baltimore and Ohio Railroad some time since.

I understand the object of the bayonet machine. The object, as I understand it, and which, it seems to me, is obvious upon an inspection of the machine, is to receive the bayonet at some certain stage in its progress, and when of a certain form, within jaws which embrace and fit it, and by which means it can be sustained and maintained in that form while some other operations of welding or smithing are performed upon the part not enclosed. That is the object in general terms. The design of the machine is to preserve the form of that portion of the body upon which the weld is to be made, which is enclosed between the jaws nearly up to the centre, as it is represented in this model (referring to the model of the bayonet socket machine marked A 3), to the centre of the socket. The concavity at the top, as exhibited in the model X X of the Cawood machine, stands, it seems to me, in precisely the same relation to the other parts as the concavity in the top of the
161 dies in the bayonet machine stands to the other parts of that machine. The vertical part of the bayonet which runs down here corresponds to the vertical part of the rail; and the commence ment of the broad part of it stands in the same relation to the others that the part enclosing the foot of the rail in the Cawood machine does to the other parts about it, so that it is entirely supported underneath throughout the entire length of the piece which is enclosed in the vice. That part of the Cawood machine which prevents the compression of the vertical web by blows, and making that weld, is that part which rests under the head of the rail—the jaws which rest under the head of the rail, and so much of the bottom as rests under the web; that is, provided it rests upon the bottom. If it is cut away, so that the rail does not rest upon the bottom, the whole is sustained by the jaws. That portion of the Cawood machine which prevents lateral expansion of the head of the rail, whilst the upper table of the rail is being welded, is just
162 so much of the jaws as come up to the sides of the head. The Springfield bayonet machine is of considerable weight. The weight of the jaws and the iron block, into which they are set, together form an anvil for the hammer. To form an anvil it is only necessary to

have the mass proportioned to the weight of the thing that strikes upon it; the general rule is that it should be about ten to one. That is the way I make a trip-hammer. A mass large enough to resist a blow in the bayonet machine, and a mass to resist a blow in the railroad machine, would be in proportion to the weight of the blow. The full-sized machine, which has here been called a bayonet machine, in which jaws have been put clasping the rail after the fashion of a bayonet machine, seems to me to be simply an enlarged edition of the Springfield bayonet machine, with jaws made to fit the sides of a rail instead of the sides of a bayonet, and the jaws are made to correspond to the form of a rail instead of the form of a bayonet. I don't see any other difference.

163 There is everything in one that there is in the other, except the simple form. Precisely the same results are produced in each. They seem to be not merely for analogous purposes, but precisely for the same purposes. By same purposes I mean the holding of the pieces of iron within them upon which some kind of welding or smithing operation is to be performed—that is what the machine does. The mending of rails and the making of bayonets is a complex operation, in which these vices or that machine are only one of the instrumentalities; but so far as the operating of that instrumentality or machine is concerned, I see no difference in the mode of operation. Looking at the operation upon the rail to consist in welding a patch to it, and to the operation of the bayonet machine as being to weld together the two sides of a curved piece that has been curved to make a socket; and looking at the function of the Cawood machine as to facilitate the welding or patching upon a rail, and looking upon the function of the bayonet machine as

164 being to facilitate the uniting, by welding, of the two edges of a plate that have been brought together to form a socket—there is no difference between the two machines that I can see. The bayonet machine, as I understand it, is used for the purpose of closing the weld which makes the socket, or completes the circle of a socket. The machine would operate the same if you had to weld a patch on the top of it. In judging of these things we must keep our mind to the particular thing the instrumentality does, and not to take into account the general purposes of which that forms a part. Looking to the function of the bayonet machine as maintaining the form next to the shank of the half-curved socket, and looking to the function of the Cawood machine as maintaining the form of the neck and lower table of the rail during the process of patching, I don't see any difference between them whatever. The pieces being considerably different in form, the jaws are made of a different shape whereby to preserve these forms; but the kind

165 of operation done is precisely the same, in precisely the same way, in my opinion. The only difference I can perceive between the large machine upon the floor, with jaws conforming to the sides of a railroad rail constructed after the pattern of the Springfield bayonet machine, and a bayonet machine, is in the form of the face of the dies. A good illustration of it, or, as it seems to me, the conclusive illustration, is, the pair of jaws that would fit into the place of the others. That machine upon the floor would hold a pair of jaws which would receive the shank and socket of the bayonet and operate just as legitimately as it does in the mending of the rail. It is equally adapted to the one and to the other. A great variety of forms can be put into it. I don't find any principle or mode of operation in the one which is not in the other. The difference in size between the machine on the floor and the bayonet machine does not affect, in any way, the means for accomplishing the respective objects, or their principle or mode of operation. Each machine is adapted

166 in size to the specific thing that it was intended to be employed for, and is comparatively efficient. Either is efficient for the purpose it was intended for. In my judgment the difference in the form of the jaws in the large machine, and in the Springfield bayonet machine, does not affect in any way their principle of operation. In all the parts of which I have been speaking, I think the Springfield bayonet machine and the machines of the patentee are substantially the same.

I know what angle iron is. The machine called the angle-iron machine (referring to the small model of angle-iron machine marked B 3, and also to the full-sized model of the angle-iron machine marked B 5), seems to have a fixed jaw with a certain configuration of face, part of it straight and the other made circular to prepare it to make the fillet, with the movable jaw to move up to it, with the means for moving the movable jaw up to the piece and confining it. It has every element, in my judgment, that the Cawood machine has,
167 excepting that the jaw is of a different form, being adapted to receive that form of the rail which was to be mended in it. The large iron machine now shown to me, with its jaws fitted to correspond to the section of railroad bars, being compared with the full-sized model of the angle-iron machine, seems to me to be substantially the same, for the same reason that I gave in relation to the comparison between the Cawood machine and the large bayonet machine, as it is called, the only difference between the two being the form of the face of the jaws, which is altered from the form which is in the model to adapt it to the kind of rail which was intended to be worked in it. Looking at the angle-iron machine as intended to preserve any existing form while another form is added to it, and that the object of the Cawood machine as to preserve the existing rail, so far as it is practicable, while it is being patched, it seems to me the same result is got in each case, and the machines seem to me to be used for precisely the same practical
168 purpose in each case—to prevent the thing, as it were, from losing its form by the hammering; that is, the operation to prevent the hammer from distorting the thing hammered upon. I find this in both machines. Comparing the Cawood machine with its jaws, corresponding to the cross-section of a railroad bar, and the angle-iron machine as represented by the model, the principle and mode of operation of these machines is not, in my judgment, affected by the shape of the jaws. I don't perceive any function performed by jaws of one shape that is not performed by the jaws of the other. In all these relations which have been described, I think the angle-iron machine is substantially the same as the machines of the patentee.

The Church machine is a more complex machine—one which is designed to do more than what is represented in the models of the defendant; that is, including the means for operating the several parts, and many other details of construction which are omitted. In that machine,
169 (Church machine, marked), the piece was intended to be confined between the jaws—right between the jaws—and in the vice resting upon the die at the bottom, or something which conforms to the shape of the thing which is enclosed, leaving the top exposed to be operated upon by an agency. I don't recollect what it is called, but it is an upper die which is brought down with great force by the application of machinery, which has the effect to close the weld and fashion the upper part of the rail at the same time; at least, that part which was welded. It welds and swages by the same operation, and by a repetition of the same operation. The Church machine is, of course, a much more complex machine than the machine of Cawood; it embraces the machine

of Cawood, and much more. The parts which hold the iron in the Church machine, and presses it to the upper die, which controls the weld and fashions it, has such a combination of parts as that it might properly be made the subject of claim in a patent. This is an inseperable and material portion of the invention, which goes to the performance of one function, among several which are performed by the machine. The Cawood machine, to the extent to which it is embodied in this machine, is precisely like it, in my judgment; that is, the mechanism by which the iron is held, confined, and kept in shape while the succeeding operation is performed upon it, the welding and fashioning it, is so far precisely the same in one machine as it is in the other. There are other things in the machines which might be specified. The Church machine was not made for welding bars, but that can be done without any difficulty by it. I apprehend, however, it would not be as convenient as a smaller machine in size. If they are required to be held and mandrilled the whole length, it would be a very good machine for that purpose—I think as good as could be made. Looking to the principle and mode of operation upon which the Kaywood machine depends for its utility, I find that, in substance, in the Church machine.

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The defendant rests.

The plaintiffs, further to sustain the issue on their part, and in rebuttal of the evidence offered by the defendant, introduced as a witness—

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W. REDFORD, who, being duly sworn, testified in substance as follows:

I reside in Chicago; I am a railroad man and a pattern-maker; I made the model of the machine used by the Illinois Central Railroad Company, which the court has before it upon the bench (indicating model of defendant's machine, marked D 2); I made it from a measurement of the machine accurately. I have been in the rail-repairing shop of the Illinois Central railroad, in Chicago, a number of times; I have seen the machine which they have there for repairing rails and making frogs. I know Ryan who was sworn here, and who was the foreman, or, rather, the head-man of one of the fires; I know him by sight. I was in the defendant's repairing shop this forenoon; they have two shops for repairing rails and making frogs; in one of those shops where they occasionally repair rails they had a machine from which I took the measurements for this model; I don't think it was for repairing four-inch rails; didn't fit it perfectly; I saw Ryan in the other shop; I found another machine there similar, with a few exceptions; it had been cut out between the jaws, perhaps three or three and a half inches wide in the centre, so that the rail rested on a flange on each side; there was a wrought-iron bar that would fit inside, that could be taken out and put in so as to fill out the space underneath; I saw that bar; it was in one of the shops; the machine that was in the other shop was not cut out; there were four or five fires in the shop where the machine was that is not cut out; I could not tell whether these fires were for mending rails; the machine I referred to as being cut out was the only one in that same shop that was cut out; in the machine cut out, the flange on the bottom of the rail would lap over an inch on each side. I had a conversation with Ryan about the size of the iron. He said they very seldom repaired there; occasionally they did repair a few rails; the principle work was making

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frogs. He hadn't but one kind of rail there, and that was a four-inch fish-rail. I saw there a solid block of wood twenty-six inches in hight, used as a rest for the ball upon the end of a lever, by which the movable jaw was moved.

Cross-examination:

I made the model referred to two or three weeks ago; I made it from a machine which I saw in the shop that had not the bottom cut out.

The plaintiffs, further to sustain the issue on their part, and in [in] rebuttal of the evidence offered by the defendant, introduced as a witness—

J. H. LAKIE, who, being duly sworn, testified in substance as follows:

174 I had charge of a shop for repairing T rails since the first of July, 1854, with the exception of about one year; it was at the junction on the Northwestern road, formerly the Galena & Chicago Union railroad; I had, previous to that time, repaired on a common block; I first had a common anvil, and next had what was called the lever-block, and next had the Cawood patent; we worked three machines in the shop; we had two machines sent from somebody in Michigan, in 1861 or 1862, in which the bottom of the rail was raised to about one-eighth of an inch above the anvil; I don't know whether they were purposely or accidentally so constructed; we tried to use these machines; the result was, they had a tendency to crack the rail, and the shank of the rail; the effect of hammering and welding upon the top of the
175 rail was to crack the rail; we threw those machines out; we used them two months or thereabouts, and then condemned them for the reason that there was no support, and they cracked the rails.

The plaintiffs, further to sustain the issue on their part, and in rebuttal of the evidence offered by the defendant, recalled—

JAMES T. RAGLAN, who testified as follows:

I have, in the course of my experience with mending rails, had rails to repair of less hight, so that they didn't touch upon the bottom; I had a piece of iron slipped under to hold the rail up; I never tried to repair rails without a support, because I didn't think it would stand up, and I used this piece to prevent its falling down. My opinion is, that in the process of welding on the top without support, it would go down. I have, very lately, since this trial commenced, seen an effort made to repair rails upon a machine, the anvil of which had been planed out so that the rail between the jaws would not touch the bottom; it
176 was a new machine; they first took the machine and repaired a rail upon it as it originally stood; it was a Cawood block, moved with a rack and pinion; we repaired some at the junction last Saturday afternoon, and this morning we repaired some at the machine shop here in town; we brought the machine down here; after repairing two or three specimens on it, I took it down into the machine shop, and planed out about half an inch; we took the same machine and put it into a planer and cut it down half an inch, and then had three or four pieces repaired with it; I brought them here into court; all the specimens we cut off from the same rail; the result was, in welding and repairing, to bring the end of the rail down; I was very particular to weld it pre-

cisely on the top as far as I could see; I worked it from the top without regard to the bottom, and this is the result (showing rail crooked on the bottom); the rail was repaired in the usual mode of repairing
177 rails, as I have been in the habit of doing, and with care; another piece was put through the same process in the machine; I then cut off the end of the rail; it is a common thing in repairing rails to cut off the end; we do that in the Cawood machine frequently and without danger of splitting the rail by cutting the end off; in this case the operation of cutting off the end was done in the usual manner; it was done before it was welded; it was cut off before the patch was welded on, and it was left nearly as it is, and then put in the machine and clamped on the top and the patch welded on. (Witness exhibited a rail, showing the end of the web split.) For the purpose of repairing rails, I should consider a machine cut out in the way I have described perfectly useless.

Cross-examination:

The jaws of the machine sustain the upper part of the rail, and they assist in sustaining it in the shape in which it now is.

178 Direct examination resumed:

The jaws fitted as nearly as jaws usually do.

The plaintiffs, further to sustain the issue on their part, and in rebuttal of the evidence offered by the defendant, then read in evidence the testimony of—

EDWARD GREENLEAF, at the trial in Detroit, as follows:

I reside at Indianapolis when at home. I am a civil engineer and an engine-maker; I have been some forty years. I was employed as a machinist at Cincinnati, by one Harkness. I think I went with him in 1847 or 1848; I was there two years. His business was building locomotives, steamboat engines, and all kinds of machinery—cotton machinery, mill-work, and heavy forging. He used angle iron. There was difficulty in forging angle iron at first. They worked at it some two or three weeks, but could not make it. They first tried to make it after I had been there about a year, I think. (A model shown to the
179 witness, marked .) This is not a very fair representation of the piece. The difficulty of making it on a common anvil was, that it made the narrow edge thin, and thick at the bottom, which caused it to hug around in the form of a circle, so that when it lay on the ground it would be raised at each end, and then straightening would spoil it, so that we found that we could not make it on a common anvil. By a common anvil, I mean the heavy cast-iron anvil—a heavy block, something like two feet square. This difficulty was overcome by making the machine to hold it with what we called a clamp. This model is a fair representation of the machine. We took a slab six inches wide, and from five to seven feet long, and one inch thick. Then we took a two-inch bar, and put it on in that form (indicating), and introduced that into the fire, and first heated it a little and weld it at the end, and then turned it around and did the same thing with the other end. Then we
180 put it into the clamps, and welded it the whole length. When that is ready a man is placed here, at one of the handles, and another there, at the other handle, and a hammer weighing three or four hundred pounds is brought to bear upon it, and the piece is brought back and forth, the hammer working very quick, until it is welded. While this is being done, the man throws up the clamp to catch it, and moves

the bar along and catches it again. It is carried on three or four times until it is brought down nearly to its size, which is, when finished, about one inch, or seven-eighths of an inch; the man operating the clamps every time it is struck. It is clamped tight every time it is struck with the hammer, six or eight inches in width, until it has all passed through, when it is thrown out. The model shown represents a piece of angle iron, except that the ends are ragged and unfinished. That is carried into the fire and finished; the ends are then squared up. If the jaws were not clamped up, the application of the hammer would be apt
181 to part them. This machine was finished and put into use in the shops not later than 1849. I am not positive of it. It removed entirely the difficulty in making angle iron. They had no difficulty afterwards. I know it was used for a year while I was there, and after that I couldn't tell, because I was not there. I never have known of anything used anywhere else, not up to that time, nor since then, until I heard of this railroad clamp. The effect of hammering upon the inside of the wide rim is, that it kept its width within a quarter of an inch; and as to the narrow rim, it brought it from a two-inch-square bar, to two and a half inches wide, and seven-eighths of an inch thick, leaving a fillet in the corner. By fillet, I mean the round part in the corner. The machine formed a fillet; that was the difficulty at first. The round corner was what throwed it off on the common anvil. They could not
182 do it, and then they got the clamp. The middle part, the corner being taken off, was what formed the fillet. When we tried the common square anvil, I couldn't work it well enough; we couldn't form this fillet. It makes a two-inch weld where there is only a seven-eighths of an inch piece put on. The hammer made the outside wider by a quarter of an inch; it made the inside something like $1\frac{1}{4}$ inches wider, leaving $\frac{7}{8}$; here would be $1\frac{1}{4}$ as the effect of the hammering. The effect of the machine, with these movable jaws was to remedy the difficulty we had at first, which was to prevent this piece from flying off from the anvil whenever the hammer came down; whenever the hammer came down it would work the edge out. These clamps left that part there almost the same shape as when put in, until it was brought up here, and worked a little on the anvil, to bring it down to what we wanted. There was nothing to keep the movable jaws down to the anvil-block. If I recollect right, their own weight kept them down. Nothing
183 was needed to keep them down. The machine worked successfully, so far as I know. It was said by every one who saw it that it did. We had no alterations to make in it; it was working when I left there. I got up that machine myself. The corners in the model now shown me are not like those in the machine; I made round corners the first time that I made it. We couldn't make round corners without a clamp, but we could make the sharp corners without. Angle iron with a sharp corner would not answer the purpose we wanted.

Cross-examination:

The model shown was not like the machine, because of these sharp corners. It would not make a fillet, and a fillet was indispensable to make good iron. The shape of the iron required it to give it strength. The machine was one solid block. Angle iron made upon a block like the model would not be good enough for that purpose; it would not
184 be a good article. We could have made angle iron with a sharp corner upon a common square anvil, but not for that purpose. It required a clamp to hold it to the round corner to form the fillet. This machine was made to make a fillet, and to make the general thing. We

commenced making it on a common square anvil, but we could not get a round corner. The fillet is a part of the two-inch piece. In working that machine the workmen would bring that clamp up tight, and would then cause a blow of the hammer to fall upon it, and then move it along, and another blow would be struck. The hammer weighed four hundred pounds. It was raised ten or twelve inches by steam-power, and the force of the blow was aided by a spring also, and you could get any weight you pleased, light or heavy. You could graduate the power. The pieces came out from the operation about two feet longer. They went in from six to seven feet long, and came out about two feet longer.

185 The object was to get a fillet in the angle, and the effect was to increase the length of both the wide and the square piece about two feet. The iron was moved after every blow; the great object was to give it the filleted corner. It came out of the operation with a fillet. We put it in here to make a square corner outside, and a fillet inside. The object of putting the iron in the machine was to form it to our particular pattern. It was put in to change from the form it had when it went in to the form it had afterwards. It was indispensable to change the form after it was put in, in order to make good angle iron. Each blow of the hammer made it a little longer and a little wider; that would be the effect of it. It changed the shape and changed the length. As it was longer from the effect of each blow, it had to move a little within the jaws. I had previously seen a common vise in various forms. I had never seen a vise with a pair of jaws to do this kind of thing. The movable jaws in the machine

186 were the whole length of the fixed jaws, to the best of my recollection. I made the pattern myself. I have not seen it since about 1850. I think that the jaws of the machine were square. The top surfaces were square. We merely rested the piece on this clamp, and not on the bottom. The wide piece didn't rest on the bottom. We hammered on both parts of the machine. The recesses were so adapted that the wide part didn't touch the bottom. The iron anvil was underneath at the bottom of these recesses, and so low down that the piece didn't touch the bottom. The anvil really was the centre piece, and that took all the blows. That and the clamp furnished the anvil part; and whenever we used the hammer, the limb which we wished to make thinner or wider was always over the anvil part, excepting the part that descended between the clamps. It was never turned over the clamp at all. The anvil part was the block.

Direct-examination resumed:

187 The purpose of this machine was to hold, by a movable jaw, the limb next to the movable jaw whilst you were working on the limb that was above—to hold it while the hammer came down, and when the hammer came down to let it go. The jaw preserved the shape of the limb which was against the movable jaw. There would be no difficulty in welding the two pieces together between these jaws. The machine was so constructed, that if the limb of the angle iron had been wide enough it would have touched the bottom. If I had wanted to make a piece of iron without a fillet, I could make it on a machine like the model with the square corners.

Cross-examination resumed:

When we commenced, the wide part of angle iron was within about an inch and a half of the bottom. If it had touched the bottom at the commencement, it would have prevented us from making it any wider. It was necessary that it should not touch the bottom.

188 The plaintiffs, further to sustain the issue on their part, and in rebuttal of the evidence offered by the defendant, read the preliminary testimony of—

EDWARD S. RENRICK from the minutes of his testimony on the trial of the Detroit case, in substance, as follows:

I reside in the city of New York. I was educated as civil and mechanical engineer; was employed for a number of years in the construction of machinery, and the superintendence of machinery particularly adapted to the manufacture of iron, and was engaged practically in the manufacture of iron, at one time having charge of a large rolling-mill, where, among other things, we rolled railroad iron. For the greater part of the last sixteen years I have been engaged principally in soliciting patents for inventions, and acting as an expert witness in the United States courts, and in that time I have been called upon to examine a large number of machines of various descriptions and point out their similarities and differences. I have read and examined a certified copy of the specifications and drawings of the patent granted
189 to Joseph D. Cawood, in controversy in this case. I have examined in court here the actual model, called the Beebe & Smith model—the model having the rack and pinion. I also examined the one marked the "Whitcomb machine," with a rack and pinion. The machine constructed like this Beebe & Smith model, adapted to mend railroad rails, and one constructed as described in the Cawood patent are substantially alike. A machine constructed in accordance with, or like this model, marked "Whitcomb machine" for the purpose of mending rails, would be substantially the same as a machine constructed as described in that patant.

Cross-examination:

In my last answer I use the qualification of and "for the purpose of mending railroad rails," because these are simply models, and I take it for granted that the machine is one constructed of a suitable size for the purpose; it would be the same machine although constructed for any other purposes. In determining the identity of machines, the purpose is always one means, and must be taken into account in determining the identity of machines; for it is perfectly clear that if
190 two machines are adapted for two entirely different purposes, that it is almost morally certain that they cannot be the same. I have known a fork that is capable of being used to put a potato, and also to put meat, into my mouth, if these be two different purposes. I have known a mill that was used for grinding corn, and also for grinding oats, if you call those two different purposes; using the word purposes in that way, I have known a machine used for two purposes. If a machine is constructed for one purpose and used for another purpose without change, it would be the same machine; but if it required change, the presumption is that it would be a different machine after that change. There might be circumstances that would make it a different machine by making it stouter. Making a machine larger might and might not make it a different machine; when it might and when it might not, I don't know. There are certain cases when it would not be so; and,
191 on the other hand, there are certain cases when it might be so. What those cases are, I don't know. I simply say there might be cases. I don't recollect of any cases at this moment. I don't recollect any instances at the present moment, where making a machine stronger would constitute it a different machine. I don't recollect that I have ever known of any such an instance at present. I have answered the

question in relation to the identity of the Smith & Beebe machine and the Cawood machines upon the assumption that I understand the description of this patent. The invention described in the patent, as I understand it, is a machine for the repairing of railroad rails, consisting of various parts which are combined together. These parts are an anvil-block, or mass of iron, that is to sustain the entire machine against the weight and the blows of the sledges, and the work that is done upon it, and to form an abutment for the press-block or jaws by which the rail is held. In the operation of the machine there are
192 these press-blocks, between which the rail is held. These are described as having their edges of the same form as the side of the rail to be repaired, and not extended up so high as the top of the rail, so that in practice the sides of the rail and a portion of the head are sustained, while the crown part of the rail is left free or unobstructed, so that a patch can be applied to it. Then there is described in the patent a certain mechanism for causing the griping of the rail between the press-blocks. The mechanism described in the patent, or one sort of mechanism described in the patent (for he states that other mechanisms can be used), is a pair of eccentric cams, by which one jaw is moved up towards the other and brought into contact with the rail confined between the two jaws so as to gripe it. The machine also forms the seat for the rails; so that when a rail is swung from the fire, and dropped down upon the seat, it is in proper position for the operation of the press-blocks to be brought up to their proper position
193 on the rail; and the arrangement of the machine is such that when the press-blocks are moved to their position, they are in their appropriate position in reference to the rail and the seat on which they are supported. I believe that that forms the principle part of the machine. In this machine the lower part of the head is sustained by the jaws. If I had a bit of a section of the model of a railroad bar a little lower to be put into this machine, the machine would be unaltered.

(Referring to model of the Cawood machine.) If I had a model of a rail with the neck shorter and the tread thinner, it would not suit this machine, and the machine could not be used, and a new pair of jaws would have to be made to fit that kind of rail, and this machine would be practically useless in mending such a rail. In giving my opinion in regard to the similarity and dissimilarity of these machines, I assume the statement in the patent that the jaws were to be the shape of the side
194 of the rail, and not so high as the top of the rail; that is, that the crown of the rail should be exposed so that a patch of the entire breadth of it could be supplied. I never saw a rail, or heard of one, two inches thick, and of the usual width of the T rail. If I had such a one to put into a machine I should follow the instructions given in the patent. If the rail is to have flat sides and then a rounded top like a T rail, I should form the face in accordance with that, and I should make them lower than the rail, the jaws only extending up to where the crown commences. The machine would be adapted to the mending of a flat rail not so thick, the top of which would come down within the sides of the jaws. The machine would be the same. It would not be in conformity with the patent for that rail, but for the one I had before it would.

Q. Then to ascertain whether a machine comes within the description of a patent or not, you must first ascertain what kind of rail it has been made to mend.

195 A. I must first ascertain whether it is a machine for repairing railroad rails, or suitable for that purpose. If you present

me with a rail that is unlike every rail that was ever made, I should say it was not a machine for that purpose.

I probably have not seen specifications of every railroad rail that was ever made. If I were shown a rail unlike any that I had ever seen I should refer it to those I knew. If a machine was adapted to something which I knew was not a rail, I should then say it was not for the repairing of railroad rails. A rail might be shown here that I had never seen, but yet I should see from its construction that it was adapted for the purpose of the railroad rail, although I might not have seen the rail before.

The witness desired to make the following explanation:

Before proceeding with the examination I should like to make an explanation. I was asked whether I had ever known of an invention made by a change of size of the thing, and was asked to point out
196 a case. Since that I recollect where a very valuable invention was made by making a thing smaller than it was before; I refer to the safety lamp by Sir Humphrey Davy. In that case there had been lanterns made in which the sides were composed of perforated metal. He made a lantern with holes smaller than had ever been made before. From that resulted one of the most valuable inventions of modern times. He made a lamp smaller; as it happened, the whole apparatus was made smaller. The difference was attributable to making the holes small. The holes bore precisely the same relationship to the metal, being made through it.

(Model of a rail marked B being shown to the witness, he says:)

Undoubtedly a machine could be made, following the specifications of the Cawood patent, to fit that. If the bar was made lower, so that the top didn't project above the top of the jaws, the machine would not be adapted to mend such a bar. The practical rails could, no doubt,
197 be made lower than those in use; and, if so made, the machine adapted to mend those in use would not be adapted to mend such rails. The anvil in the Cawood machine sustains the jaws against the strain that is imposed upon them, and forms a basis for the mechanism by which one jaw is moved towards the other. I think these are all its essential characteristics—that it should be a heavy mass of iron forming the bed of the machine, sustaining the jaws, and forming the basis of the instrumentalities by which one jaw is moved towards the other. In the Cawood machine the side of the rail lies directly on what is called the anvil; but that is not an essential point, because it may be in the jaw. If the creases or grooves at the end of the block in the model marked Joseph D. Cawood were cut off, leaving the remaining parts there, all that is essential to the machine would remain there still. Following the description of the patent, the movable jaw must be
198 adapted to the side of the rail, not so high as the top of the rail, so as not to envelop the top of the rail. It must be so built, when moved to its position, it will be properly situated in reference to the other parts. There must be a certain relationship between the face of the jaw and the side which supports the rail. That machine must be capable of producing the effect desired. The means of moving the movable jaw must be capable of moving it rapidly, and of sustaining it in its place, and strong enough in its construction; but, otherwise, I don't understand that it is confined to a particular mechanical device, further than it must be sufficient, and move it in the right direction to the right place. If it were moved by a wedge—if the wedge were so arranged as to move it with the required rapidity, I think it would be within the limits of the patent, and if the wedge were also capable of

holding it in its place. The fixed jaw, within the limitations of the patent, must be a jaw that is formed like the side of a rail—a little
199 lower than the side of a rail; and it must be either permanently secured to the anvil-block, or so connected that it is secured at the time the rail is being repaired. I don't understand that it is necessary that it should be cast upon the block as part of it. It might be so, and it might be within the description; and it might be fastened by other means, and still be within the description. If bolted down it would be substantially within the description. I don't understand that it is necessarily within the description of the patent that the movable jaw should be fastened to the anvil by dovetails, or dovetail pieces, in contradistinction to some other way that would produce the same effect, and that is to guide the jaw to its place; and there is not the necessity that they should be dovetail grooves, and nothing else. If you remove from the model marked Joseph D. Cawood the side pins which guide and hold it down, and substitute nothing for that purpose, and
200 allow the movable jaw to slide on the anvil—if that was removed—and allowed to slide loosely so that it could move in any direction, I don't think it would be within the description, as it would not be a practicably valuable machine. I think there should be some means to guide it as it moves. In this machine here (the full-sized Cawood machine) it is guided to its place by the lugs. They hold it laterally. I think that is within the specifications. I don't think it is necessary to hold it vertically, because the weight of the movable jaw itself is enough to hold it on. The way the model marked Joseph D. Cawood is constructed, I think the eccentrics might guide it laterally; I think they would act in that way. If one were constructed like that, omitting the sidewise grooves, I think it would be within the specifications. The top of the movable jaws represented in the drawing of the patent, is formed in an arch that would bear against the sides of the eccentric. There are only two differences between the model marked Joseph D. Cawood and the machine described in the patent, that I notice. I suppose, of
201 course, that the crank is applied to one end of the shaft. I have seen one in the court, somewheres, which is like that described in the drawing. In the machine shown in the drawing, the plate of the movable jaw, that is, the part which corresponds with a part of this machine, the model on which the silver plate is attached ("Joseph D. Cawood" is marked on a silver plate) is made in the form of an arch, so as to ride over the cams, and thus protect them from dirt. Thus, in place of having a bar with dovetail grooves attached to the side of the anvil-block, some little distance inside, there are grooves in the model formed upon the rim of the anvil-block, and in place of the grooves of the movable jaw of the patent-drawings, the model has these lugs which overlap the anvil, and the lugs have pins which pass below the ribs. Then, on the shaft of the model, there is a heavy piece put beside the crank, which I have not noticed in the drawings. Then, I notice in the drawings, that the pillow-blocks or standards on which that shaft turns are arranged, with the line of the joint, horizontal; while in
202 these the cap of the pillow-block is set at an angle instead of horizontal. I think these are the only points of difference I noticed. A machine could be constructed to fit the sides of the rail or bar marked B. If I had a machine, and used it for filing a part of the bar, it would still be the same machine. If a machine was made with the face of the press-blocks to fit the face or sides of a rail of the form of Exhibit A, and a machine was made for the purpose of holding a bar to file one end of it, and it is used for that purpose and no other, and

the sides of the jaws were made to fit the sides of the rails perfectly, such a machine would be, I should say, in accordance with the patent. The creases on the end of the model marked Joseph D. Cawood, I call swage-grooves. If that portion of the block containing those grooves was cut off, it would still be substantially the same machine, leaving an amount of block sufficient for the purpose for which it was required.

203 Direct examination resumed:

I was asked on my cross-examination if I could remember an instance where a machine had been changed and an invention made by changing the size of it. I recollect there was a machine for making lead pipe, which was the subject of great controversy. I don't recall an old machine that was raked up that was not strong enough for the purpose; but I believe there was a machine produced that had been used for making clay pipes, and which was utterly inadequate to the purpose.

Cross-examination resumed:

In this machine referred to there was a certain means or instrumentality for accomplishing the object in view. The old machine didn't have this, but it had parts which, if they had been strong enough, might have been used for the purpose. If it had had the same parts it would have acted with the same effect upon the mass of cold metal. It might
204 have pushed putty through the machine. I think if I had a machine by which I could make putty pipes, that in consequence of its being made stronger, it might be a different machine. I think if lead pipes had not been made by that operation, and could not be made by that operation, and a man should change the machine so as to enable him to operate on lead, he would have a right to a patent for it, simply by strengthening the parts, where in that way you produce a result which could not otherwise be produced. The invention might be adapting the thing to a purpose for which it was not adapted before, and that adaptation, in connection with the idea, would be the invention. If I had a gimlet handle sufficient to turn a gimlet, but not strong enough to turn an auger, it would not be an invention to make it stronger, for the purpose is the same. In the old machine the tube was cast; in the other it was forced out while the model was in a hot state. That was the difference in the mode of drawing.

205 The plaintiffs, further to sustain the issue on their part, and in rebuttal of the evidence by the defendant, then read in evidence the testimony of—

EDWARD S. RENRICK, upon a former trial at Detroit, in substance as follows:

Taking the small model of the Cawood machine, with the two small rails of different size, now shown to me, and placing said rails in said model, I find that the jaws are not as high in either case as the top of the rails. In both the head of the rail projects above the jaws. The crown of the rail is also unobstructed, so that a patch can be applied, and the jaws fit the side of the rail from the head downwards so as to sustain it. I regard this relation of the crown of the rail to the jaws as essential in order to allow a patch to be applied with facility—for the surplus iron to be worked off and the crown to be swaged down to a level with the remainder of the rail. It is essential to the practical working of the machine. I was engaged in the manufacture of iron
206 for a number of years. When iron that has been hammered or rolled is heated up to a welding heat, there is a tendency in the

iron to change its structure. The structure which has been fibrous tends to be granular or crystalline. Iron also is rendered softer, so that if permitted to cool without performing any operation upon it, it is softer than it was before. Hence, in welding, two operations are necessary—first, to cause the two pieces of iron to stick together; and, second, to condense and solidify, so as to restore as much as possible the structure which had been affected by the heat. For the purpose of causing the two pieces to stick together, light blows are all that is necessary when the two pieces are nearly uniform, so that one will lie flat on the other; but after the iron has adhered it should be struck with heavy blows, in order that it may be welded and consolidated. The heavier the blow the better, because the consolidation is more rapidly effected while
207 the heat is properly retained. On the other hand, if the surfaces of the iron are irregular, like the surfaces of a broken rail, and another piece of iron is to be welded on it—the work to be done without scarfing the rail—in such a case if the iron with a patch be put up in the mould so that it cannot escape, heavy blows are advantageous, because they drive down the soft iron into the serrated part of the rail and cause the parts to adhere to each other. Therefore, in the Cawood machine, if you operate upon rails not scarfed, it is an advantage to use light blows in the operation of making a patch stick fast to every portion of the rail to which it is applied. After that it is important to use heavy blows in order to consolidate the iron. That is particularly the case when the swage is applied, which is generally done when the iron is at a low temperature; then the advantage of heavy blows is very great. The support at the sides of the rail is absolutely necessary, otherwise the rail would be crushed down by the force of the blow.
208 If you take an irregularly worn piece of rail and confine it in the machine and strike heavy blows, it has a tendency to make a perfect weld, because it drives the iron down into the broken surface of the rail. It would make a more perfect union of the parts than if the rail was scarfed and a smooth piece of iron put on, because the irregularities work into each other. In welding the pieces to the rail without such a machine you must of necessity make light blows in order to prevent the mashing down of the surface of the rail; and you must scarf the rail so as to make it nearly uniform.

I heard Mr. Greenleaf's testimony on the angle-iron machine, and I have the model in my hand. I am acquainted with the mode in which he used that working machine as described by him. The machine, as I understand it, was devised for the purpose of changing the form of pieces of iron which had previously been welded together and were placed in the machine under a hammer. As I understood Mr. Green-
209 leaf, the two pieces of iron were forced to adhere together by placing them on the flat surfaces of these intermediate blocks. After they were welded in that way, they were then put in the machine, and their form changed by the operation of the machine. The jaw of the machine was to keep the limb of the angle iron erect and to press it against the centre support, while the hammer pounded upon the other limb, while the hammer spread it out in breadth and drove it down between the jaws. The one must of necessity be driven down between the jaws as the other is reduced in thickness by the blows of the hammer. The fillet in the angle iron greatly increases its strength. I suppose it would practically double the strength of the iron to resist a change in its formation; that is, the rending of the two limbs from each other. It forms a brace. The strain comes principally upon the angle, both sides acting as levers. The purpose of the machine, as I under

stand by looking at it, would be to change the form of the iron to
210 spread out the head and form the fillet, and while this was being done the jaws keep the limb of the iron upright and permit it to slide down between them. If that fillet must be formed, it must go down the length of that groove; if it could not be driven down, the machine would not be useful; it would be practically useless for that purpose. There is another difficulty about it, and that is if you attempt to patch a piece on top, there would be nothing to prevent its lateral expansion. I understood Mr. Greenleaf to say that that limb expanded from two to three and a half inches, and that the operation of the machine upon the article in it, was to take two pieces welded together with a sharp angle, first change the figures so as to thin out both limbs, extending them in length and width, and notwithstanding this extension it is made stronger because of the fillet; much stronger to resist this tendency to pull them sidewise; much stronger than a similar bar without the fillet. It is substantially different in every respect from the Cawood machine
211 in principle and mode of operation. It permits spreading where the Cawood machine prevents spreading. The Cawood machine prevents iron from getting down between the jaws. The angle-iron machine permits the iron to go down that a fillet may be formed. In the Cawood machine the under half of the head is prevented from spreading laterally. One feature of the angle-iron machine is to allow it to spread from two to three and a half inches. (The witness taking the model of the angle-iron machine with a rail in it, says:) This piece rests on the bottom, and in a practical machine we described it as not going to the bottom. The depth had to be greater than the greatest breadth the iron had spread to. It is material to this rail that there is no fillet in it. This iron was laid on stringers that were sawed off. In the ordinary process of sawing, the corners were square, and therefore the iron fits it. If there were a fillet in that corner we would have to dress off the corners of the stringers. The corner of the rail is also made round; is
212 made so for the reason that if it had been sharp it would have been affected by the wheels of the railroad cars, because the tread of the wheel and the flange are not accommodated by a square corner, but by a round corner. A railroad wheel has a fillet. With a sharp corner to the rail, the rail would be at once affected by the action of the wheel upon it. It would be very much battered, and, perhaps, exfoliated before the rest of the rail would be affected. In mending a rail in the angle-iron machine, there would be no gripe whatever to prevent the limb going down below the crown of the rail, and it would prevent spreading no more than the common anvil would. When you want to work and hammer the rail, the crown of the rail, being square, is not supported by the corner of a machine which is round, and the rail would of necessity have its shape changed, and it is possible the flange might be injured very much by being partially broken down. In considering a
213 machine I think it is necessary to consider its adaptability to the purpose had in view—that is, the working character in every machine; because, if it is not adapted to its purpose, it will be practically useless. This angle-iron machine, in its principle and mode of operation, is substantially unlike the machine described by Cawood.

I have seen these bayonet machines in operation. In the Springfield armory they are called treadle or foot vices. I don't recollect that I ever heard them called anvil-vices until I came here. I watched the operation of these machines long enough to see each step performed, and thoroughly understand it. There was one form of the machine which is not represented here. I will mention it as I pass along. In

the operation of welding the parts of the bayonet together, the blade having been first formed with a button on the end of the neck there (indicating by the model), is heated up to a welding heat, and a piece of iron which has previously been hammered by a trip-hammer
214 (being held under it by tongs) into the shape of a plate, is also heated up to a welding heat. The bayonet was placed in this machine (indicating model marked A 1), and the plate so placed over it, and the one driven down upon the other, so as to stick the blade of the bayonet and the plate together. That being done, the parts that have formed the side of the bayonet and the plate were heated and placed in the machine, represented by model A 2, which had a broad, flat face at the top, with two grooves in it to form a bead in the underside of the plate. This was subsequently formed into the bend of the bayonet, and the part here which is slotted out, so as to form the foot, so as to make the bayonet fast to the barrel. The iron was then placed in this machine (A 2) under a trip-hammer. The machine was not exactly like this, but a great deal broader. It was like this, except I didn't see any
215 stop of any kind as is shown in this model, A 2, to furnish a limit to the depression of the lever and the action of the cam. And I didn't say it was a machine with a larger face than this; I was speaking of the plate. When the hammer was permitted to strike on the plate, the effect was to spread out the plate so that it was very much larger in extent than before, and to drive the projection which had previously been formed into these grooves so as to form beads on the under side of the plate, in substance like this (illustrating by the model), the exterior becoming very irregular in form, there being nothing whatever to prevent the head spreading out. It was permitted to spread in order to go into these grooves. The rough edges were then trimmed off by shears, and worked upon until the bayonet assumed the form of the one which I now hold in my hand (showing bayonet with plate). The bayonet was then heated and placed over a stamp with a Y top, and the plate driven down so as to bend it. The bend was first done by
216 driving the fuller down. It was then taken, and the ends of the bayonet straightened. The edges of the [of the] plate were turned up so as to bring them together; the bayonet was then in the form represented by this (showing short metal bayonet), the lips of this plate being brought together. It was then heated to a welding heat, a pin put in it, and it was subjected to the action of a machine, of which there is no model here, having grooves to receive the lower half of the socket so that the blade of the bayonet would bear upon the swage-block for a short distance. While it was there, a hammer, having a face fitted of reversed form, was driven upon it, and that formed it into the required shape. After that was done it was placed in this machine, A 3, which is intended to represent the full-sized machine produced here. While it was in that machine, it was pounded by a hammer having the half groove for its face. The effect was that the fin was driven down and worked in instead of being cut off. The bayonet blade
217 does not rest on a die underneath. The blow is received full upon the bayonet itself, and that is resting upon the face of the jaw which covers everything. After the bayonet has been hammered as much as the workmen think proper in this machine, it is put back into the swage-block and swaged over again. That was the way I saw this machine in use. I have been acquainted with the common vice many years. I consider it substantially different from these Springfield machines. These machines are adapted to a special purpose, and have parts so formed and proportions especially adapted to that purpose.

The common vice has not these forms and proportions. In this machine both the jaws receive the blows of the hammer, and it is indispensable that they should do so; whilst in the common vise the whole force is borne by one jaw and by a pin in the foot of the other. Hence in these machines the jaws are so constructed that they have a solid support, and the pin is relieved from the strain. I think they are substantially a different machine, and have a substantially different purpose.

218 I consider the Cawood machine, as described, as substantially different from the bayonet machines each and all of them, which have been produced. They all have jaws of one kind or another. The jaws in one machine differ from those in others, just the same as a man and a chicken both have legs, but the legs of the chicken are adapted to the chicken, and the legs of a man are adapted to a man. So, also, a man has arms, and so has a chicken; but the chicken's are adapted to one purpose, and the man's to another. The structures are different with a view to the different purposes for which they are to be used. The structure of the bayonet machine is of such size and proportion as to adapt it to operate upon bayonets; while that of the Cawood machine is such as to adapt it to operate upon railroad rails. One peculiarity of the Cawood machine is that the rail must extend above the part that supports it, so that it can be worked upon. In all the

219 bayonet machines, some part of the metal to be acted upon extends above the jaws. In two of the machines there is no provision to prevent its spreading; in fact, spreading is the purpose of the machine. In this machine (A 3) and the Cawood machine, there is another difference; that is, in the bayonet machine, the part of the article that is let below the jaws is presented endwise to the part which is operated upon; as, for example, if you presented a rail with the end upward, and then operated upon the top of it. Comparing the bayonet machines with the angle-iron machines, I would say the bayonet machines are especially adapted to their purpose, and the angle-iron machines to theirs. They have jaws of different kinds to perform the different purposes for which they are formed, as separate machines. No one of these machines would be a machine for mending rails with any change that could be mede. It would be a different machine.

220 Taking the knowledge that Cawood has given us of the proper sort of jaws for holding rails, the dimensions of the machine are utterly inadequate to repair rails. The language of the patent, "close to this is cast a raised block D * * * so as to enclose the rail between the two, as in the jaws of a vice." I don't understand, in this description of the jaws, that he authorizes or permits any other construction of the jaws than those which leave the crown of the rail above the jaw itself. I find no other description or representation in the drawings. In any other way it would not be a practical machine. In practice it would be impossible to gauge the exact size of a patch to the space to be filled up. It is within the limits of possibility that it might be done, but it would take up so much of the time of the smith that it would cost more than sending the rail to be rerolled. If the machine demanded this, it would be practically valueless for mending rails.

221 The operation in the machine is this: "Having a piece of iron of a size to fit the deficiency of the rail, it is brought to a welding heat;" then it is laid on top of the rail and welded to the rail, and by the application of a swage it is brought down so as to be of the form of that part of the rail which projects above the block; it is finished off by a tool in the shape of a top of a rail, and the use of the tool necessarily requires that the jaws should not go up to the top of the rail,

because if they did the swage could not go down to the iron. The drawings show that the jaws come up to the widest part of the rail, and there stop; and there is no difficulty after welding on a patch to shape it in that form. In the angle-iron machine there is nothing to make the jaw move parallel—a jaw made in that way can cant around in any direction while moving up.

222 I have examened the machine standing at the foot of the stairs outside of this building—(the Laporte machine). It is a Cawood machine; it has the characteristics of the Cawood machine; the sides are built up and left open. Such a structure as that requires greater weight to make it such a machine as Cawood describes. In order to adapt it to the purposes required, there must be sufficient strength in the machine. If you build it up open, making the jaws light, you require more power to do the work. I don't consider it a bayonet machine. If I wanted a bayonet machine and had that given me, I should think it best to put it into the fire and make it into metal to fashion over again. I know of no purpose that it could be applied to without material change; because you would have to throw away several of the parts that are needed in the manufacture of bayonets, and that would make it useless for the manufacture of bayonets.

223 I know of no purpose that a rail-mending machine could be applied to but holding a rail while some operation was being performed upon it, without substantially changing its applicability for the purpose of mending rails, or holding rails while being repaired. You might weld two new rails together. In doing that the machine would be for substantially the same purpose as is performed by the Cawood machine.

I never in my life saw or heard of such things as the Church machine patent in operation. I never saw a hollow rail like this of Church's. The rail is a tube. It would not be a practical rail, looking at it as a rail to ride on in cars drawn by locomotives.

(Witness is shown a model of a U rail.)

I have seen rails shaped like this on the outside but much thicker in proportion, and therefore the interior of the cavity was much smaller. The corners of the flanges and the interior were all square instead of being very materially rounded as in this. This would give one the idea

224 of a boiler plate bent into shape. It is not of strength sufficient for practical use. I believe they have gone out of use. I saw some taken up on the Baltimore & Ohio railroad, below Harper's Ferry. About ten or eleven years ago they were taking them all up and replacing them with the T rail with fish joint.

I have already stated in substance that the Church machine was substantially different in principle and mode of operation from the Cawood machine. They are substantially different from the Cawood machine in the purpose for which they are designed, in the combination and organization of the machine, and in the mode of operation; and another substantial difference is the manner in which the press-blocks are combined. In both the Church machines described in the patent of Church, the press blocks are combined by means of a frame or end cast in one massive piece of one thickness throughout. Press-blocks are combined by

225 means of these ends, they having tenons upon them and sliding in grooves. If you had at the end of the Cawood machine end frames about eight inches in thickness, and not open, solid and thick, you would see the difficulty you would have in getting at the work. There is another substantial difference in the structure of the hammer. That is combined with the end frames at the ends, which is used for the purpose of forming a guide for the central movable press-

block to slide up and down. Then the machines are substantially different in their combination. The press-blocks are combined with the end so as to form a box to prevent the lateral spreading of the top of the article to be operated upon. Church describes the two machines of the character of A 10 to be made use of for the purpose of making these tubular rails. He commences on the lower part of page seven, describing a die for bending the iron into a V form; that form is represented in the drawing. He then states, that after the iron is bent into that form, it was withdrawn from this machine, was heated, and was afterwards introduced into another machine having other forms of dies. Then he describes the figure 34, which represents a cross-section of that machine, and figure 35, which represents a longitudinal section. Figure 35 shows the side upon which the lower die rests. This section line represents that section of the die. Now this shows the end frames overlapping the end of the die and projecting up. Now if you go back to figure 35, you will see that that bottom die on which the rail rests is lower than the opening through the foot through which the rail was introduced. If you measure the thickness of the lower die on figure 34 where the rail is shown as resting directly on the bottom and apply it to figure 35, you find that it would actually bring it still lower down; that is, the die is shown a little thinner, if anything, in figure 34, than it is in figure 35, so that there can be no doubt that the seat upon which the rail rests is lower than the frame.

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227 Cross-examination:

Figure 35 shows a sectional view, which shows the outline of the outside. It is not a view of the outside of the machine, but it shows the outline of the outside, and therefore shows the position of the sides of the outside. Then in figures 31 and 33 we have two other views of the outside of the machine, looking downwards, which show the outline of the outside, and by applying the knowledge which we derive from these figures we obtain all that is necessary to understand the machine. Figures 31 and 33 show the machine, looking downwards. Figure 32 shows the end view of the machine, for bending the rail; and he describes that the other machine is similar to it. He also shows in figure 34, and cross-section of the machine, a view of the far end of the machine, by which you see it has the same outline as that shown in figure 32; it shows the form of the exterior; it represents an end view of the machine; it represents the aperature through which the operator working the machine works. You could not get a rail in, because the hole is not large enough to get a rail in. To get a rail in I should have to cut the hole out. That might or might not require invention. If, to change the machine in the way proposed enables you to perform an operation which you could not otherwise perform, I should say that that made a substantial difference in the machine; and I further say that these machines could not be used for operating upon a rail in mending. I have no doubt that you could not get a rail in there, because it is not as high as a rail.

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If you go to work and alter the machine so as to receive and mend a rail, which you could not otherwise do, I have no doubt it would make a substantially different machine. I know that is a sectional view, and like any other sectional view it shows the outline of the outside; I mean so far as the proportions are concerned, it shows just as well as any view. Referring to figure 28, there is not any view of the machine, the outside end of which was represented in the other figures. There is a view of the dies which the patentee describes

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as to be used in the machine, and on measuring that, I find that [that] there is the same discrepancy there. I think that, following the descriptions, and taking the view in the drawings, that the dies represented in view C (or 6) are the dies which he intends to use in the machine. I should say that figures 28, 29, and 30 represented views of the dies which the inventor intends to use for the purpose of fitting a rail. Figures 25, 26, and 27 represent views of the dies which the inventor intends to operate in the machine for bending, as shown in end view in figure 32. Figures 25, 26, and 27 represent parts of the same machine. They represent dies in different positions. Figure 26 is intended to show the condition of a piece after figure 25 has operated upon it—after it has operated to a certain extent upon it—not the complete operation—after the top die has come down and the side dies have come
230 up and bent in the iron to a certain distance. Figure 26 represents the piece or sheet after it is bent. After the top die has come down and the side dies have closed, the condition of the article is represented in figure 26. Figure 27 represents the condition of a bar or piece after the operations which have been done in figure 26 have been performed upon it. I suppose in all these you have been using the same machine all the time. I understand the patentee to say so. The bar is then taken out of the machine and heated; then it is introduced into the other machine, which has dies like figures 28, 29, and 30. Then a mandril is put into the tube, or is already in it. These are views of the other machine—the parts of the other machine—of the mandril and the apparatus for holding the mandril. It differs from the others, because it has different-shaped dies; and more than that, it differs in the mandril also. The mandril is a piece of iron to make hollow rails, and
231 this yellow figure gives an end view of it. That is, it would be the end of the rail, and the top is open to receive the mandril. If I had been holding a bar of iron in clamps for the purpose of straightening it, and for some cause or other I desired to weld a piece on it, and found these clamps a little too high, so that I could not weld a piece on without heating the edge of the clamps, whether I would know enough to make these clamps lower might depend upon a variety of circumstances. Suppose, in the first instance, the idea of patching a rail had never been brought before my mind, or I had always seen it done by hand. In such a case as this, if I should conceive that the machine should be so altered as to leave the crown of the rail exposed, and I should go and alter the machine, I have no doubt I should make a substantial invention—not the slightest. I can suppose myself using the clamps to straighten a bar of iron, and I can suppose that while
232 I am thus engaged, a man comes along and requests me to weld a piece on, and I can suppose that on hearing this request I would begin to think about welding a piece on. If, in attempting to do it, I find the jaws a little too high for convenience, I might, or might not, know enough to make them lower so as to make them right for the hammer. If I had seen such an operation done before, I should know enough to do it. If I had seen a rail patched before in a pair of jaws, then I should know enough to do it. If I had seen one done on a common anvil, then I should not know enough to do it. I should know enough to do that when I had already seen a rail patched between a pair of jaws—when I had seen a rail in a pair of jaws ready for patching. When the rail is broken down so as to put it in the jaws, the broken part is below the top of the jaws. The jaws protect the part that is left and form a mould for the piece that you operate upon, and the piece that you have left. That is the best answer and the

233 best explanation I can give; but I think I could show, by some analogies, what the reason of the thing was. I don't know that at Springfield these machines, representing the Springfield machines, are sometimes called Springfield anvil-vises, and sometimes bayonet machines. I consider the machine represented by model A 3 a substantially different machine from those represented by A 1 and A 2—in this particular, that they have a die or dies adapted to perform a different operation, and to put in an article of a different shape, so that it is affecting a different purpose at the time the article is subjected to it. They have dies different in kind. Sometimes a difference in the shape of the dies may make no essential difference in the character of the machine, sometimes it may—depending upon circumstances. The machine represented in model A 4 for making gun-hammers has two jaws adapted to hold a piece of iron between them while a man oper-
234 ates upon it and the piece projects above the jaws. A 1 has two jaws; not the kind of jaws in A 4, but jaws adapted to receive the iron—that is, some kind of jaws. They are to receive it in order that a certain operation may be performed upon it—the welding on of a piece. They receive it not only to hold it but to support the piece and every part of it against the blows of the hammer. They receive it to hold it. They so receive it and hold it for the operator to pound upon the top, if he is so disposed. It is pounded upon the top for the purpose of welding a piece of iron on a piece so held. The jaws receive a piece of iron to hold it with a portion of it above the surface. They hold it to be pounded upon by the operator, who pounds upon it for the purpose of welding a piece on. While they hold it the jaws preserve the shape of the iron so that the jaws are adapted to receive a piece to hold it so that it may be pounded upon at the top, and not for the pur-
235 pose of welding, but for the purpose of plating out the top. It is plated out, and at the same time, the under side is changed by being driven into the grooves, or top of the jaws. The welding had been done before it came there, as I saw it performed in the armory. If, instead of putting in a piece there that had the plate piece welded upon it, I had put a piece in that had not the flat piece welded upon it, and had the neck projected a little above the face of the jaw, and then wanted to weld a piece on, it would be the same machine. It is the same machine, whether it is used for welding a piece on the neck, or for changing the form, because it is adapted to both these purposes.

I have said in relation to model A 6 (model of Laporte machine), that I should consider it substantially a Cawood machine, because I believe the objects of that machine, as evidenced by its construction and dimensions, shows that it is a machine adapted to patch rails, and not adapted to perform any other purpose in the arts. It is for that
236 purpose, so far as I know, because I know of no other purpose in the arts to which that machine could be usefully applied, and, consequently, it is a Cawood machine, because it contains substantially the combination set forth in the Cawood patent. In the second place, the press-blocks in the machine are constructed according to the rule of construction described in the Cawood patent. Cawood gives a rule of construction for the press-blocks: it is that the press-blocks should be fitted to the side of the rail, so that they should not come up quite to the top of the rail. Towards the close of his patent, he describes how these jaws permit a swag of the form of the crown of the rail, and therefore having its lips lapped over the sides of the rails to be used. Thirdly, it is a Cawood machine, because it contains substantially the Cawood machine; that is, it contains two such jaws, made according to that rule

of construction, combined together by a heavy block with an
237 anvil, enabling these two jaws to come together. Fourthly, it is a Cawood machine because the sides of the rail have a certain relation to the seat upon which the rail rests, so that it is firmly held down upon the seat while it is griped on its sides. In the Cawood machine the seat is in the bottom, but I don't think it would make a substantial difference to have it in the jaws as in the Beebe & Smith machine. That whole mass which forms the mass of the machine, I call the anvil. The whole sustaining mass, I should consider the anvil part, irrespective of the movable jaw. If you cut off the fixed jaw, you would still have the anvil part left. The fixed jaw is either cast on the anvil part as described in the Cawood patent, or attached to it. You may say that the seat was formed in a part of this fixed jaw, if you think fit; but I don't think it is material whether you make it a part of the fixed
238 jaw or of the anvil-block. Now you may make a separation there at the line (witness drew a pencil line on the model), which you may call the line A, the line of separation between the jaw and the anvil-block. They are actually, however, cast in one piece. It is immaterial which of the two lines you take. It is immaterial whether you consider the seat a part of the anvil or of the fixed jaw. The seat is in the machine, and it is immaterial which part you put it on. The slots in the sides of the movable jaw is a rest for the rail, but the strain is carried down to the anvil-block below it, because if you were to take out the anvil-block below there is nothing left to support it. Take out the jaw, and the machine would not operate successfully. You would not have taken away a part of the anvil, but you would have cut away the relation which exists between the seat and the anvil; you would not have cut away a part of the anvil, but you would have cut away
239 that part of the seat on which the bar rests, and which corresponds with the upper part of the movable jaw. As I said before, it is not material whether you have the seat in the jaw or in the anvil. I see in model A 1 something which partakes of the nature of a seat of the anvil. The bayonets, however, are made precisely of the same size. There is not a difference of a quarter, or an eighth, or a sixteenth of an inch. So far as practical skill is concerned, I have no doubt Mr. Cooley knows more than I do about these machines, but so far as the combination and the relation of the different parts are concerned, I think I am as well qualified to speak as any one. In these machines, the lower part and the shoe which sustains the article and resists the blows of the hammer, is the anvil. I think that is all there is in these machines. I don't mean to say that is all, but I say that this lower part, extending down, and connecting with the movable
240 jaw and the shoe, partake of the nature of an anvil. The shoe and the part above it partake of the nature of an anvil. They correspond with model A 6 undoubtedly. If I were to show a man by drawing a line between the vise and the anvil, I should suppose that line to be about where the fixed jaw and the movable jaw are connected together. So far as regards the anvil character, every particle of iron in the machine is more or less of that character, in consequence of its inertia protecting the articles from the blows; and, if I were to distinguish the part which is the anvil from that which is the vice, I should take the lower parts of the machine from the place where the jaws are connected together. The piece of iron in that machine had a place to repose upon, and the place it reposes upon is where I place my finger (pointing to the hinge or joint in the bayonet machine). As I saw it in practical operation, the neck didn't repose upon that part (indi-

241 cating dies in the bayonet machine). When I put a piece of iron on an iron bed, and hammer it, and that piece of iron is sufficiently supported, that bed would act as an anvil. Suppose I had an anvil, and I wanted to make a bolt, or have to head a bolt, the heading tool would be placed upon the anvil, but it would not be the anvil; and so these dies are laid upon this part, but I should not consider them the anvil. The anvil I should consider the mass of iron below, which sustains this against the operation of the blow. Dies are applied to change the form of articles in other forms of machine. A change of dies does not always make a substantial difference in kind. In the embossing press, where there is a large variety of forms and different figures, I consider these dies make a substantial difference. I should say the same of dies for making spoons; it would be a different kind of spoon.

242 Referring to board which represents a section of the Beebe & Smith machine, with a rib or mid-feather in it, it would be substantially the Beebe & Smith machine, but it would have a substantial addition made to it in that mid-feather to mend a different kind of rail; and the man who invented the mid-feather would have made a valuable addition to the machine, if it turned out to be useful, and I consider this useful. A Beebe & Smith machine has two jaws. I don't consider the Cawood machine as limited to a fixed jaw, but I consider when it has come to its position, it shall be solid and fixed, or else it would not hold the rail. It might hold it enough for one purpose, though not for another. If you changed the dies in the angle-iron machine, you would have a machine for welding railroad rails. That might, or might not, change the essential character of the machine. It would depend upon the position. If you change it so as to make a seat for the article to rest upon, I have no doubt it would be a substantial

243 change in the machine, because you would then have got a structure and mode of operation, which is not in the angle-iron machine, because you would have a seat. If I put in the Cawood dies, it would make a substantial difference in the machine, because a seat would be formed. If you would change the dies in the Cawood machine, and adapt it for another purpose, I think you would change the machine, for you would adapt it to a purpose inconsistent with its present use. My idea is if you take an old machine and apply it to a new purpose, you change the machine if you change the machine.

(In reply to a question by plaintiffs' counsel:)

In putting in the Cawood dies with a view to the rule of construction set forth in his patent, you would have a substantial change.

(In reply to a question by the court:)

244 If you take an old machine and apply it to a new purpose, by making changes, no matter how slight the change in the purpose, it involves an essential change in the principle of the machine; and let me go a step further, these changes are inconsistent with the purpose to which the machine was first applied. That is to say, if you change the configuration of the jaws in any of these machines—the bayonet or the Church machines—if you change the jaws so as to adapt it to a purpose to which it was not applicable at all until the dies were changed, then you change the essential character of the machines. And there is one point more—that this new purpose is inconsistent with the mode of operation of the machine. In the angle-iron machine it was necessary that the material should be permitted to spread downwards. Now, such a mode of operation would be inconsistent with the Cawood

machine, because in that the material is prevented from spreading downwards.

(In reply to plaintiffs' counsel:)

You have to throw away the old machine, and make a new
245 machine.

(In reply to a question by the court:)

The angle-iron machine is not adapted to a change of dies.

(In reply to defendant's counsel:)

I mean to say that you cannot change the dies so as to adapt it to the purpose of the Cawood machine without throwing that entirely away. You might chip these dies. I mean to tell the jury that both these jaws might be chipped and filed into some different configuration, but you could not change these dies in these machines so as to make it a Cawood machine. Such a change would make them a new machine. I mean to say that these jaws can't be changed consistent with their size, and consistent with the purpose of the machine. In speaking of these I am speaking of this particular machine.

(In reply to question by the court:)

Suppose you enlarged it, and changed the form of the jaws,
246 that would be an essential change of the machine, because it would be a substantial change of the machine.

(In reply to defendant's counsel:)

I mean to say that if you made a change of the jaws, and so finished these jaws that you were enabled to perform an operation which you could not perform in this machine before, and which this machine does not in any manner suggest, I think there is no doubt that the new machine would be substantially different in kind from this one. I mean to state to this jury that a machine like this angle-iron machine is incapable of having jaws or clamps changed to a different configuration without making a substantial change. It is capable of being made into a steam-engine. You can put jaws into it adapted to a bar of round iron, but it would be a very small one. That space is about two inches wide, and you might put jaws in that would take a piece of round iron.

You can make a change of jaws in the Cawood machine if you
247 keep within the rule of construction. The patentee says you may have a change, but he says you must have it on a certain rule of construction. Keeping in mind the difficulty in changing the configuration of jaws in the angle-iron machine, you can change the configuration of jaws in the Cawood machine, but in changing them, in order to keep it a Cawood machine, you must always confine yourself within the rule of construction which is laid down and which is essential to that machine. If you make a change, so as to take it out of that rule of construction, it is no longer a Cawood machine, and no longer adapted to the purpose for which it was contrived. The patent says that in the Cawood machine the configuration of the jaws may be changed, but it lays down a rule of construction, and you are not to go outside of that which qualifies it. As long as I keep within the principles of con-
248 struction I would not find any more difficulty in changing the face of the jaws in the angle-iron machine than I would in the Cawood machine. If I went outside of the rule of construction I would have the same difficulty in both cases. I might change the jaws to different forms of rails, keeping within his rule of construction. The

moment I went outside, thereby adapting the machine to a different purpose, there would be a difficulty, because the description of the Cawood machine does not give any rule for making such change. So long as I keep within the rule of construction in making the change in the jaws of this Cawood machine, I don't think there would be any great difficulty. There might be a case where there would be a very great difficulty, but I don't know of any difficulty so long as I kept within the rule of construction. A change within his rule of construction does not involve a difficulty when a change outside of it does involve a
249 difficulty, for this reason—that I have no rules given me to make any change. If I wanted to make a Cawood machine to patch a double-headed rail, I would then make my jaws according to the rule of construction in the patent, with the jaws coming nearly up to the top of the rail.

(In reply to question by plaintiffs' counsel:)

I would arrange it in reference to the anvil.

(In reply to defendant's counsel:)

In this angle-iron machine I don't know of any other form of angle iron but that. I can't conceive of any other form that it can be changed to without changing the machine. You could not change it to an O. G., without making a substantial change.

(In reply to question by the court:)

When I speak of the rule of construction, I mean the rule of mechanical construction.

(In reply to the defendant's counsel:)

The rule of construction in reference to the machine represented
250 by model A 4 is, that the bar of iron should be held in it endwise, with the upper end projecting above the surface of the jaws which gripe it, and that the top of the iron shall be above the top of the jaws in the machine. But you must put the iron to be held endwise. The rule of construction in respect to the machine represented by model A 1 is, that the iron should be griped sidewise, so that the crown should be presented endwise to the hammer. If, in speaking of machines represented by model A 3, I am confined to the relations between the top of the material to be operated upon and the top of the jaws holding it; if I am confined to that one peculiarity of the machine, I should say that that part of the rule of construction consisted in holding the material, so that a part of it could be projected above the jaws, more than you wanted to work upon, in order to be able to put it in and take it out; that is, so far as regarded that one principle, but you have left out other portions of the rule of construction.

251 (In reply to plaintiffs' counsel:)

In the Church machine we have a form of dies that suit the railroad rails. It does not follow that we have not therefore a machine like the Cawood machine. When I suppose a change of dies, it is necessary to have them combined with relation to the anvil and movable jaw, so that I may have a bearing part for the article to be operated upon. If I suppose a change of jaws in this machine and nothing more, I have not a practical machine for my purpose, because the other parts of the machine are here, and they are in the way. Take the angle-iron machine, and change it in its jaws, and, so far as I know, it is good for nothing, and you have to change their relation to the machine and so

combine them with the anvil that the machine is practical, and combine them with each other. I have never spoken of the mere change of die, except it be as a mere change of the shape of the die. I have kept the relations still in view. There is no difficulty in chipping
252 out one die and putting in another in the machine. There is no difficulty in taking an-angle iron machine, and by applying a chisel and file, change the face of the dies, but it would be good for nothing—good for nothing at all. You would have to change the form of the dies; and not only that, but to adapt it to a new purpose you change the nature and purpose and combination. The models A 9 and A 10 are not given and represented in the drawings and specifications. On the contrary, the intentions are that the parts are to retain the same relationship, and the frame of this A 9 is represented without any joint whatever, as if it were cast in one piece; and the ends of the piece in A 10 are represented in the same manner. They are cast in one piece. In these models the top parts move off. The machine marked A 9 is for the purpose of straightening and flattening a rail, and is capable of being used for that purpose; I am certain about that. I
253 think it might, but it would make a poor machine for that purpose. I think the rail would not be flattened, unless previously heated for that purpose, and therefore when a rail was taken out it would be slightly crooked again, and would have to be straightened when cold. Rails are generally straightened when cold, because when they are straightened cold, they do not afterwards change their form. I don't think they could be straightened cold in that machine, because of the elasticity of the iron. When you bend a rail you must bend it a little further than where you want it to remain, and then when it comes back by the elasticity of the rail, it will be straightened. Hence, in practical rail-straightening, it is laid on two supports. The pressure is applied to the metal between these supports. The rail is pressed a little further than is necessary to bend it just to straighten it. It is bent a little beyond, so that when it
254 comes back by its elasticity it will be straight. I don't think Church describes his machine as a machine for straightening heated rails; he merely says for straightening and flattening rails. I think it would be useless for cold rails, and also for heated rails, because if it was taken out hot, the handling would tend to make it swag. Another objection would be the immense cost of the machine. Machine A 10 is described for making tubular rails. I don't think it would be a practical machine for that purpose, I think it would be a great deal cheaper to roll it as ordinary wrought-iron tubes are rolled than to have it done in this manner. Angle iron is rolled like a rail; is rolled out of a large square mass of iron, and passed through a series of grooves, which successively differ in form, so that the iron is greatly lengthened, and its form undergoes a change. That machine, represented by model A 10, would appear to be intended to represent a machine to
255 make tubular rails. It describes the bar as first being shaped by means of dies, represented in figures 25, 26, and 27, and these dies consist of a bottom die, two side dies, and a top die; that, he says, is done in one machine. He says the bar being put in that shape is withdrawn from that machine, and then introduced into another machine, as in figure 28, with dies. The dies for the last machine are such as are represented in this model (red rail model No. 2). The side dies are brought up and closed, and the top die is then brought down. It is a necessity in the use of that machine that these dies should unite in pressing a rail in such a manner that the jaws close firmly up to straighten the weld,

for the reason the iron is cut of the exact size before it is bent up into a tube. The machine will not work for the purpose, and upon the plan of the instructions, unless it works in that way. It is designed to
256 prevent the escape of the metal in any direction, so as at every part of the rail to produce a round weld. If there was a different quantity of metal in different parts of the piece, it could not be practically used, because there is no place for it to come out, and it would leave a bunch in one part which would prevent the dies touching the rail in others. The working of that machine requires absolute verity and trueness in the action upon the rail throughout. Nothing is said about patching rails in that machine. I think it will be useless for that purpose. I think it would not be practical to work with a swage placed under the hammer. The model does not represent the actual machine. In the machine there is a heavy double-lever beam, right across on each end, connecting these levers together. In this machine they are both represented as pulling in the same direction, whilst in the description of the patent they are not. If the lever beam were put in, it would prevent these jaws in the model from
257 coming together. Suppose a rail was of the ordinary size of a rail, it would project some sixteen or eighteen inches beyond the anvil, and would leave a small space between it and the hammer, as seen in figure 32, which represents one of the machines, and the swage would have to be put into that narrow space between the two, and the man would have to get down here and squint into that place, and the end of the rail, following the description of this drawing, would be about two or two and a half feet from him. If the swage were narrower than the rail the swage would be pressed down, and the metal would come up on each side of it; but if the swage were wide enough, there would be no space for the metal to go. When the iron is swaged it is done at a lower heat than welding heat, and when it is at that comparatively low heat, I don't think there will be any lateral expansion; I think the
258 model A 10 is substantially different in its principle and mode of operation to the principles described by Cawood. It is one of the distinguishing features of the Cawood machine that its jaws are adapted to the rail to be operated upon; that is, that the jaws come up to about the widest parts of the rail and leave the crown unobstructed; I don't think this machine adapted to mending a rail in any way. I don't think it would be as good as a common anvil. I think the rail could be sooner repaired on a common anvil than in this machine. The jaws are made to overlap the rail, and, if you put a rail down to the point shown by this rail here, and then put a patch on the top of it in the space between these jaws, wider than the space, and attempt to put the jaws together, inasmuch as you should always have a surplus of metal, the edges of the bar would project above the corners of these press-
259 blocks, and when you come to put down these press-blocks upon it, the metal would prevent its coming down to its proper place, so that I think there would be an imperfect weld upon each side of the rail. On the other hand, if you were to put a narrow patch on, and attempt to press that down, the first effect would be to make the bottom part weld to the top part of the rail. This would require some way or other to make the materials push into the cavities, and I think it would be impracticable. I suppose it is within the limits of possibility, and, I have no doubt, an ingenious mechanic could succeed in patching a rail in that machine, but he could do it a great deal better on a common anvil. The other machine, represented by model A 9, has the same difficulty with reference to the press-block; that is, the press-blocks hold

the thicker part of the rail, and that would be an insuperable objection in the way of welding. I suppose if a man had his iron of the
260 exact size and shape, his rail perfectly level, he might be able to put a patch on. I think it would show anything but good sense to use that when you could have a swage-block or an anvil. It is substantially a different machine from the Cawood machine. These jaws are substantially different from the Cawood machine in proportion and form relatively to the object they have to act upon. The proportion required by the Cawood machine is that the crown of the rail shall not be overlapped, and the dies must correspond with the form of the rail. It is like in some of its features. It has a press-block; it has a frame, and in this they are alike, but in the general proportions they are different. They are unlike in their operation; that is, if you would mend a rail in this machine, you would have to form the dies in the one different to that in the Cawood. If you attempted to patch a rail in that machine at the end, you would have an insuperable difficulty.
261 If you had to put a patch in the middle you would have it ten feet from you. It would be very difficult if you wanted to patch it at the end. As I said before, I believe a man could succeed in doing it if he would take time for it. The machine, represented by model A 9, demands for its construction and mode of operation and purpose for which it is used, that there should also be absolute trueness in the dies as they are working down; for if they don't strike the article truly, they would not come down on one part of the rail. In the other machine it is necessary that the die should come down in order to form the tube. In A 12 the dies differ from those I have referred to. My impression is that Church didn't intend to describe jaws with the form of A 12, because he says that the jaws which he had previously described were to be used in this machine. In drawing it he shows jaws that are a little
262 narrower on the crown at the top than A 12, but, in other respects, they are substantially the same. That is to be used in A 10 for making tubular rails. The jaws are not gathered in on both sides, and, in that respect, it differs from the other two of which I have spoken; but the dies come up to the head of the rail, and, therefore, there is no place for the surplus metal. This machine, with these dies, would be perfectly useless, because it does not produce the effect that would make it a practical machine. As a machine, as a whole, I regard it as substantially different from the Cawood machine, because the jaws are the substantial part of the machine as described in the patent. It says that you are to change them in form to adapt them to any article which you are to operate upon; but he does not say anything about a provision for the escape of the surplus metal. If a man were to get a ma-
263 chine like that, he has to make a die for the purpose he would use the machine for. The dies must be conformed to the article you want to operate upon. Suppose I had to operate upon a rail like this (rail marked No. 2); I have to change the dies and adapt them to this article, but I find no directions in the Church patent to leave the crown off so that the surplus metal could escape under the swage employed by Cawood. Maintaining the character of the machine he describes has nothing to do with the dies at all. You must change the dies.

264 The plaintiffs, further to sustain the issues on their part, next produced as a witness—

HARVEY WATERS, who, being first duly sworn, deposed in substance as follows:

Since 1819 I have been concerned in about as many patent cases as any

one man in my course of life. I have examined the Cawood patent and machine. Am acquainted with the machines that are used for the manufacture of bayonets, or parts of bayonets, which have been alluded to here. Have been acquainted with the manufacture of bayonets ever since I was a boy running about the works of my father, who was a contractor for the manufacture of muskets during the last war with Great Britain. I am acquainted with the machines used in Springfield for the manufacture of bayonets. In describing the mode of manufacturing bayonets, I would mention that some time during the rebellion there was an essential change made in the manufacture of bayonets at Springfield. Before that time the proceeding was to get out enough steel for two bayonets. It was done by hydrostatic measure-
265 ment, because merchant bars of steel were of unequal size, varying as much as one-eighth of an inch in diameter. At that time they always used a pound of steel for a bayonet—sometimes a little more. After drawing out the blades, they then made the necks from this piece of irregular size, and, consequently, this piece here (showing the shank of the bayonet) was thrown further away from the blade than before. They (that is the shanks) were swaged down after the blades were formed, and not before.

Afterwards, and while I was making bayonets for Springfield, this method of making the socket before the bayonet was made was carried into operation by me, because I soon found that if I had to forge the bayonets instead of rolling them, the contract would not be much worth, as they only paid three and a half cents for them. It seemed to me that if I could only dispense with the milling of the blade it would be a great saving. To do this I made a machine having a proper relation to the shank already produced; after doing this, and getting my machine to work in perfection, I found that twelve ounces was enough of steel, instead of sixteen ounces, and the milling was entirely dispensed with. They took these bayonets at Springfield, and ground them up
266 from the rolling, instead of annealing the steel and then milling it, which deteriorated the quality of the steel. I understood that they paid just the same for grinding my rolled bayonet from the rolling that they paid before for grinding them from the milling. By the change I made in rolling the blades, they were able to come to greater accuracy in the parallelism of the socket and the blade, relatively considered. The amount of variation was found to be not the one-sixtieth part of an inch.

I will now come to the machines, of which there are several, and they are not all alike,

This machine (showing the model marked A 1) is simply a heading tool for the purpose of making shanks. The machine is made to open, and the neck is bent round in this way (showing model marked E 1). This (showing the traddle attached to the model) has not much to do with the machine; it is just a traddle heading-machine. It is just the same as the old traddle heading-machine for heading nails. Each particular nail is put into the die, and then they are struck with a hammer, which forms the head. Only this machine (showing model marked
267 A 1) has this cut here (showing the hollow part coming out at the side in which the neck of the bayonet rested). That machine does not come up to the requirements of the machine for making nails.

This machine (showing model marked A 2) is used after the plate is struck. Now, if it pinches the shank so as not to allow the dies to shut close, it is against the rule of the machine. The dies must come together in nearly all of their length, because if they do not come together it will make a fin on the plate. Now, in the machine for mending rails the

dies must not come together, while in this machine the dies must come together. It is the same as the other, except in the part which takes the neck. This stands upon an anvil (showing the plate out of which the socket of the bayonet is formed) whose inertia takes the blow of the hammer, and is struck at with a trip-hammer until it is spread out as broad as desired. The plate is then bent over to what is termed side and edge, for welding. (The witness here showed model marked E 1.) If the edges were lapped over, it would be lap-welding; if the two edges were brought together, it would be butt-welding. My first knowledge was
268 that they were lapped over and welded with light hammers. That has been changed at Springfield; and, instead of being rolled over on a pin, as formerly, they are rolled over in that machine. (Witness here showed model marked A 3.) Now, this machine is the same as the others; and, inasmuch as the dies do touch each other, they cannot be brought to pinch even the neck, unless it is exactly the size, which it very seldom is.

The character of this machine (witness here alluded to an iron machine which had been in actual use at the Springfield armory) is the same as the others, and it was made to shut up completely by the foot, so as to preclude any fin passing down between the jaws, and then the piece is put in with a mandril in it, and the upper die comes down and welds it on the pin or mandril. When the welding is done, there is not always a correct relation between the neck and the socket.

There is another machine in which a trip-hammer is used, and which has a die in the lower part which has no means of opening at all. They lay the part in this machine, so that the socket will fit into it. This part (showing the neck of the bayonet) comes out. The upper die is the converse of the lower. They put a pin in here (witness here pointed to
269 the hole in the bayonet socket) and let the upper die come down on it with a blow of six or eight or ten hundred pounds. By this means the relationship between the parts is corrected. It will be seen from this model of a bayonet (showing model marked E 2), that it was struck in this manner. It shows the mark of the die. If the shank is made a little longer or a little larger, it substantially corrects it. The socket is then bored, and the socket is turned in a lathe as far as it can be turned. They are very particular, and require great accuracy at last at Springfield.

That is the manner of using the bayonet machines. The rule in all of them is that they shall shut up—shut together. In my opinion, they are substantially unlike the Cawood machine in more respects than one. In the Cawood machine one of the conditions of its proper success, as set out in the patent, is that the anvil upon which the jaws rest or repose, and which sustains the jaws, should have such relation to the height of the jaws themselves that the anvil shall not only support the jaws of the machine but shall also support the rail. There is no such provision in any of these machines. The other difference—and which I have already mentioned—is that in the Cawood machine the jaws or dies must
270 not come together, they must pinch the rail; the rule of the bayonet machines is that they must not pinch the piece put between them.

I am acquainted with the angle-iron machine, its use and character, as well as its construction and mode of operation. I see a model of it there. (Witness pointed to model marked B 3.) The usual way of making angle iron is by rolling it. This machine is a makeshift, but has, for that purpose, an advantage over the trip-hammer proper.

Now, if I understand it right, this (pointing to the raised part in the

middle of the model) is the anvil, and the hammer works upon that anvil always. To enable the operator to keep the metal up to the anvil there is put a jaw, moved up by a cam; and I acknowledge that it is a very respectable contrivance when you have not got a rolling-mill. Rolling the iron, as you would roll a rail, is the best.

Now, it is not a rail-mending machine, because you cannot fix a rail upon it without altering it. It is not a Cawood machine, because the relations of the parts are different as it stands. In the Cawood machine the anvil is under the rail, while here (in the angle-iron machine) the
271 anvil is at the top. If you must mend a rail upon it, you must not only change its action, but you must change the relation of the parts. If the rail does not rest on the bottom, I consider the machine of no good for this purpose; at any rate, I consider it essential that the rail should rest on the bottom. If it does not do so, you have no anvil, unless the jaws themselves are the anvil. Comparing the moveable jaw in this machine and the moveable jaw in the Cawood machine, and the fixed jaws in each of them, the machines are not the same. The object of the moveable jaw on the angle-iron machine is simply to keep the metal up to the anvil. In the Cawood machine the object is not to keep the rail in position, but to receive the blows of the hammer. Both jaws take a part of the effect of the blow and convey it to the anvil itself; both jaws are, in fact, parts of the anvil. The practical effect of taking away that lower support for the rail in the Cawood machine would, for the great purpose of its use, be the ruin of the machine, substantially. I have seen work done upon a Cawood machine this morning, with the bottom planed off so that the rail would not rest upon it. It did not act
272 exactly so bad as I expected. The action was as that rail (witness pointed to a piece of rail which had been mended in the machine as described) shows, for I saw it done. I will, however, state that the split in the rail was caused by the cutting off of the end. The machine was a new one and did not fit the rail well; too much had been taken off the moveable jaw, so that it did not come up and support the cheeks of the rail. Two mends were made in it in the usual way. I suppose it to be the usual way, because I directed it and was particular about it. The results in the two cases were just contrary. One came out a little narrower, and the other a little wider, than the regular size. With the bottom in, it came out one way; with the bottom taken out, it came out the other way; so that if the lower edge of the rail was brought to a straight line, the upper edge would be crowning, and vice versa.

Q. In both cases was it not due to the relation between the bottom, the jaws, and the rail?

A. I so understood it.

I have examined the "Church" specifications and drawings, so that I understand them. That model (witness pointed to model marked
273 C C) is a fair representation of one of the machines described. That I believe (witness here showed a drawing in connection with the patent) is intended to represent a machine designed to form a hollow rail. This (witness here showed model marked C C) is that machine, substantially, so far as it goes. I do not see anything here (in the model) for the purpose of pulling the mandril out.

Q. Is there anything of that kind in the patent?

A. Yes, sir; and pretty quick; the description says it will shrink on there if you do not pull it pretty quick. I believe it will shrink on even if you do pull it pretty quick.

Q. Do you think it could be taken out, practically?

A. I do not know whether practically, but not economically. By

"practicable" I understand what is done as a mechanical feat. By "practically" I understand what is done as a matter of business. I doubt whether a rail could be mended in this machine at all.

I consider it a fancy sketch by a man who had a profusion of ideas, but who lost sight of the collateral circumstances connected with the machine. If it was made it would be found entirely impracticable for the purpose of repairing rails—it could not be used at all for that
274 purpose. It cannot be done. The conditions in the Cawood machine are, that there shall be an anvil, the jaws, and a hammer to weld the piece on the rail. In the machine represented by the model marked C C there is no anvil, there is no hammer. It is simply a press. Now if this machine does not contain mathematically the exact quantity of metal, there is no chance of driving it down and welding it. If the patch does not fit perfectly in every way, you won't get it down. And then, besides all that, you cannot get the rail into it, and with a die of the form that is in the model, you cannot put a patch on a rail. The condition of the Cawood machine is such that you close the dies before you put the patch on. The dies in this machine (showing model marked C C) do not allow you to put the patch on after.

Red rail model No. 1 being shown to witness, he testified as follows:

This seems to be a fair representation in one view. Take another view, it is not. These dies (showing the side dies) must come over sufficiently to allow this die (showing the upper die) to go down. Now, as
275 far as the mere welding is concerned, I have no doubt it could be welded, though welded badly; it would not be strong enough—I mean in this machine. It would not be strong enough to stand the shock of a locomotive.

The machine for straightening rails (showing model marked A A) would not be a practical machine for that purpose. You could not straighten a cold rail unless by crooking it in the opposite direction, so as to allow its elasticity to bring it to a right line. In straightening hot rails, by repeated experiments they get to know how much to allow for the effect of contraction, and thus they get them straight; they are obliged to have them straight when cold. If you make it straight when it is hot, as this machine would, you cannot tell what will be its condition when it is cold, for the reason of the contraction. It is not a machine that could be employed to repair rails, for the same reason that the other (alluding to model marked C C) is not. Both machines (alluding to models marked A A and C C) are substantially different from the Cawood machine.

This machine (witness showed model marked D 2) has not sufficient facility for moving up the jaw. They cannot move it back far
276 enough to admit a rail, and then move it up and do it quickly. If you are to weld these things, you must do it quickly. It won't do to fuss about much. Now, if you have this wedge (witness pointed to the wedge in the model by which the moveable jaw is moved) very obtuse, it will fly out when you pound upon it. Being as it is now, acute, it does not give facility of movement enough. But the machine is a mongrel.

Cross-examjnation:

I see in your hand an unfinished portion of a bayonet; I notice that the weld in it is not made; also that a portion of the bayonet has been filed a little, as I see it is bright; I think it represents the condition of the bayonet before it is put into a machine like model marked A 3, except

that there should be a mandril in it. It has been put into that shape by being put into something previously, which rounded the flat plate, and brought the edges together. The next process is to weld it, and approximately to give it a shape for the next operation.

277 Q. This tool before me (model marked A 3) is a machine to receive the bayonet, and there hold it in a form adapted to whatever has been already done to it, until this welding takes place.

A. I will take a little exception to that statement, sir.

Q. Let me repeat my question. This then is a tool—whatever we call it, an anvil, vice, or not—this then is a tool into which the bayonet, brought into the shape that we have agreed upon, is placed, that it may be welded and forged with a view to subsequent operations?

A. Yes, sir; but that is not quite what you said before.

Q. I understand then that this may be honestly described as a tool to weld the two parts together, brought in contact?

A. That is all it is for.

Q. Now, we will go a little further. If this had no mandril in it, or even if it had a mandril in it, and these jaws, cut out to fit the lower part, were not there to prevent it, would there not be an expansion laterally under the blow of the hammer?

A. There would, sir; more than there would be without them.

278 It is proper that the force of the descending blow should be resisted by something like an anvil, shaped to the shape of the article. The tool is a tool to facilitate the welding, and at the same time to preserve the thing from expansion laterally, or compression vertically; and it is something more—it holds the thing up.

In mending railroad bars, the operation is performed by welding upon the bar a patch to replace the portion of iron destroyed by wear. In doing so, it is necessary that there should be something to resist the blows consequent upon the welding. It is also necessary to have something to prevent lateral expansion.

Q. We have here (showing model marked X X) a model of the Cawood machine. In this machine the bottom resists vertical compression, and the side jaws resist lateral expansion?

A. Let me see about that—whether it is quite a fair statement of the thing. I will tell you how I understand it. I understand it that there are two supports. This (showing the bottom of the model) may be considered as an anvil; and these (showing the moveable and fixed jaws) are for the purpose of holding up the crown of the rail. If you

279 take away these you get the rail too wide. You want to hold them up so that a portion of the metal shall not work down below the jaws. Now, there is no such provision here. The parts you have referred to in the model marked X X prevent the distortion of the rail in any direction.

Q. Then, sir, likening small things to large ones, is not the Cawood machine a tool to facilitate the welding which is to mend a rail, by holding the rail and obviating the tendency of the welding to produce expansion or distortion laterally, and compression vertically?

A. That is a part of it, but it is not the whole of it.

Q. But is it not a tool?

A. I should call it a machine.

Q. But does it do more as a machine than prevent the compression of the rail, and the expansion or distortion of the upper table of it?

A. Yes, sir; if it is pretty hot it prevents the disfiguration of the lower section of the rail.

Q. I accept the addition, sir. As I now understand you, it is a tool,

or a machine to mend a rail, which prevents the distortion of the
280 the rail either in its neck, the lower portion, or the upper table while in mending.

A. That is a machine which prevents its distortion everywhere, while you are putting it in form, if the machine be made right.

In relation to the angle-iron machine (showing model marked B 3), I do not think I ever said that it had no bottom on which the web of iron rested while the other web was being hammered. I said it had no anvil for the purpose of mending a rail.

Q. I understood you said this piece of iron did not go to the bottom?

A. I do not think I said that, but it is understood.

Q. Would there have been any mechanical difficulty in putting a bar of iron in that machine for the purpose of affording a bottom?

A. No; but I do not think it is contemplated for that.

Q. What I want to ask you is a question of fact—whether it would require mechanical contrivance or ingenuity to put a piece of iron in there in order to prevent the compression of any part of the article being worked upon?

281 A. That is a very dangerous question, sir. Take a steamer; there is nothing new in it; it had all been done before. Just so. There is nothing new in propelling it by wheels; it had been done before. There is nothing new in turning that machine by a crank; that was the way we did it. There was nothing new in moving it by a steam-engine; that was done before. Now, it is very difficult to say what does or does not require mechanical contrivance and ingenuity. The question is, not what will that machine do if altered in a certain way, but the question is, will that machine do it?

Q. That is not the question I was asking you. I am not destructive but reconstructive.

A. Now, if here is a machine that will do one thing, and another machine that will not do it, I ain't going to stand here to make that other machine do it. I make this argument to show what I mean by mechanical contrivance.

If a piece of iron, with a fillet already formed, be put in that machine, and the moveable jaw or die held firmly up to the lower member
282 of the iron, by hammering on the other member to spread it along the top of the anvil part of the machine, the form of the fillet will be preserved, but the form of the lower part will not be preserved, nor will that of the upper part. If a bar be put in to prevent the compression of the lower part, and the lower part be held firmly at the bottom and at the sides, its form will be preserved.

Q. Now, that machine (showing model marked B 5) is in the shop. I put into the jaws of that machine a cross-section of a rail which I want to mend, and leave a portion of it above the machine?

A. So as to hold the rail firmly there?

Q. So as to hold the rail firmly there, bottom and sides. Will not that be a Cawood machine?

A. I have no doubt it will mend a rail. It will have imperfections in relation to the cam, but I think it would do pretty well. Another thing is, that the cam only works in one direction; still I think you can mend a rail in it. If you will make it so that the rail could rest upon the bottom you could mend a rail perhaps as well, but no better.

283 Q. Is that machine as it stands now a Cawood machine?

A. It is not, most decidedly.

Q. Now, if I indent it so as to put a rail in it, will it be a Cawood machine?

A. It will be a sort of mongrel Cawood.

Q. I understand you then that in the present instance it is not a Cawood machine, and that in the case I supposed—altering the jaws to fit and support the rail—it would be a Cawood machine?

A. If altered to fit and support the rail.

Q. That is all.

Red rail model No. 2 being shown to witness, he testifies as follows:

That is a cross-section of a double-headed railroad bar—represented as compressed, on the bottom and two sides, by an anvil and lateral blocks. The top of the bar is level with the top of the side jaws. I think it would require mechanical ingenuity in a man who wanted to weld a patch on the top of that bar, to lower the side jaws so as to enable him to do it. If there was a machine consisting of an anvil and side jaws, adapted to fit a rail as that model does, and it should
284 turn out that the rail required mending, there would be mechanical ingenuity in reducing the height of these jaws so as facilitate the mending.

In this machine (showing model marked C C) there is represented a contrivance by which a weld can be taken on the top of a whole rail; it is the welding of two edges together laterally. That machine is to hold the sides together so as to facilitate the welding. The sides and bottom sustain the rail against compression and lateral expansion. They do not alone do this; there is a mandril as well.

Q. Do you consider this model—the Beebe and Smith's—an infringement or substantially the same as the Cawood machine? You will observe that the jaws of this come close together. (Showing model marked D 3.)

A. Where, sir? The jaws are not close together.

Q. Here is this model; it is sworn to as being a correct model. I raise and open the jaws so as to let the rail in; I drop them and they fall together, just as your Harper's Ferry machine falls together. Is that substantially the same as the Cawood patent?

285 A. I think it is, sir.

Re-direct examination:

Q. The jaws, you say, do not come together?

A. They do not. The anvil comes together.

Re-cross-examination:

Q. You say these two pieces here (showing the lower part of the pieces forming the jaws) do not come together?

A. The part here (showing the portion in which the rail fits) does not come together. What you speak of is the anvil.

The foregoing is the substance of all the testimony introduced on the trial of said cause.

286 And after arguments of counsel, the court took the case under advisement; and, subsequently, to wit, on the 8th day of November, A. D. 1867, that being one of the days of the October term, A. D. 1867, aforesaid, of said court, announced and gave the following opinion, rulings, and decision therein, that is to say:

This is an action at law against the defendant for the violation of a patent of the plaintiffs, which they hold as assignees of Joseph D. Cawood, and which was issued to him September 9th, 1856, for a new and useful improvement on the common anvil or swage block, for the purpose of welding up and reforming the ends of railroad rails when they

have become injured by wear. The questions of law and fact have, by agreement, been submitted to the court, and we have had all the assistance in their investigation which the very able arguments of counsel on both sides could furnish.

The patent has already come before the Supreme Court for examination, and a construction has been given to the specifications by that court, which is a guide to us on this occasion. Turrill vs. Railroad Company, 1 Wallace, 491.

The specifications set forth the manner of constructing the
287 machine. There is a bed-sill on which there is an anvil or swage block, of iron. There are dies across the face, of the shape of the side of the rail. There is a raised solid block, making a part of the anvil. There is then a movable press-block operated back and forth by eccentric cams. The sides of the raised block and the movable press-block are made to fit and receive the rail, so that when they are pressed together by the motion of the press-block they, in conjunction with the anvil beneath, hold the rail firmly for the purpose of welding and reforming the ends of the rails. The machine and its mode of operation are particularly described, the foregoing being a mere sketch.

The Supreme Court say in the case just referred to: "Obviously, it is not a claim for any kind of movable press-blocks combined and operating in any way with any kind of fixed block to accomplish any purpose or effect any kind of result. * * * The invention was of such a movable press-block as is described, having its edge formed to the side of the rail in combination with such other block as is described, with its edge of similar but reversed form, arranged as described, and operating
in the particular way described, for the special purpose of effecting
288 the described result." With this construction of the patent before us, the inquiry is, whether any of the machines introduced by the defendant are substantially the same as that of the plaintiffs.

And to the opinion and ruling of the court above given, relating to the construction of the plaintiffs' patent, the defendant, by its counsel, then and there excepted; and the court proceeded with their opinion and rulings as follows:

The infringement is admitted, but it is insisted that the machine of the plaintiffs, in all essential particulars, is identical with several machines previously well-known, namely, the bayonet machine, as used in the United States armory at Springfield, Massachusetts, for the construction of bayonets; the angle-iron machine, as used at Cincinnati for the construction of the frames of locomotive engines; and the machine described in the English patent of William Church, issued in 1846.

The bayonet machine was one form of a common vice, operated by a treadle and elastic spring; the jaws of the vice having dies cut in them of the contour of that part of the bayonet and socket which they were
to hold while the welding or hammering process was going on. If
289 the machine of the plaintiffs, was no more than this, then the patent would fail. We are inclined to agree with defendant's witnesses that as soon as the jaws of a vice are cut to the form of any instrument to be held, the idea would naturally be suggested that they might be changed to suit any shape. But the Cawood machine is something more than a vice with jaws shaped to receive the thing to be held. It has what is, in some respects, similar to the jaws of a vice adjusted to the thing, but there was a modification of some of the elements of the bayonet machine, so as to change the mode of operation, and to produce a new result; and to properly appreciate the difference we must regard its adaptation of means to ends, and ascertain whether there is

not something new in this respect in the patented machine. We think there is, and to hold otherwise would very much limit the field of discovery, confessedly, within some of the elements and combinations of the bayonet machine.

And to the foregoing part of said opinion and rulings of the court relating to the analysis and construction of the bayonet machine and of the machine of the plaintiffs, and the comparison of said machines,
290 the defendant, by its counsel, then & there excepted; and the court continued their opinion and ruling as follows:

The angle-iron machine bears a stronger analogy to the Cawood machine. In the angle-iron machine there is the main anvil beneath and above a fixed anvil, and at the side of the latter and upon the lower anvil is a movable press-block. The sides of the fixed anvil were rounded, and two bars of iron were flattened or brought to any desired shape and welded together by means of the fixed anvil and the press-block, the result of the hammering under these circumstances being the welding of the iron, so as to produce the angle iron with a fillet, as it was turned at the angles, thereby strengthening the iron to be used for the frame-work of the locomotives. The press-block in this machine was moved towards the fixed anvil by a cam, but moved back by hand or other force in that way applied. Now, it is clear that this machine cannot be successfully used to produce the effect caused by the operation of the Cawood machine. In the latter the structure of the side of the anvil and press-block is different, and adjusted to the rail.
291 The rail, in the act of hammering and welding, is held by the press-block and raised solid block, and at the same time supported by the main anvil. The forming process is effected differently. In the angle-iron machine the relation of the parts of the machine to the thing to be constructed was not the same. The fixed anvil performed a different function, and the anvil beneath took no part directly in the working of the iron. The angle-iron machine would not effectually perform the function of mending rails. A change was made in that machine. There was a modification of some of the various parts, and, in consequence of that, the other result is obtained. It may be said that the change here is not very great, and that the plaintiffs' patent has somewhat narrow ground to stand on; but not more so, we think, than many patents that have been sustained by the courts. A slight change, sometimes, of a known machine, or in some of its parts, will effect surprising results; and to protect a party who, by inventing such change, has produced a new and useful result, was certainly one of the objects of the patent laws.

And to the foregoing part of the opinion and ruling of the court
292 relating to the construction, use, and capabilities of the angle-iron machine, and the analysis of its parts and their functions, and the comparison of said machine with the machine of the plaintiffs, and also to the construction of the patent of the plaintiffs, as contained in said comparison, the defendant, by its counsel, then and there excepted; and the court continued their opinion and ruling in said case as follows:

The English patent of William Church, though in one part it described a machine for holding railroad rails during a certain working process therein set forth, it is clear does not contain in substance the machine of Cawood, applying it to Church's specifications. There are jaws to hold the bar in Church's machine, and there is what has been termed a press-block; but it is manifest, we think, that it would not be a practical machine for producing the results effected by Cawood's. Besides, there

is no evidence before us that Church's machine has ever been used for any practical purpose having a bearing on the machine of the plaintiffs, nor, indeed, for any practical purpose whatever.

293 And to the foregoing part of the opinion of the court relating to the Church machine, its structure, and uses, and its relations to the machine of the plaintiffs, the defendant, by its counsel, excepted; and the court continued their opinion and rulings as follows:

The question in this case is mainly one of fact, and we have not gone into details as to the differences between the three machines, relied on by the defendant, and the Cawood machine, but have only referred to them in a general way; and we have rather given our conclusions than the reasoning on which they are founded.

We have had the benefit of the testimony of several eminent experts; but, as is not uncommon in difficult cases, they do not agree in their opinions as to what are matters of form and what matters of substance; and we have been obliged to draw our own inferences, aided by them and the arguments of counsel, chiefly from an inspection of the machines and the models which have been produced before us, and, applying the construction of the [of the] plaintiffs' patent, as given by the Supreme Court, to the three machines introduced by the de-

294 fendant, we think they are not substantially the same as the machine of the plaintiffs, and therefor that the Cawood patent is valid.

And to the conclusion of the court as above given, and the reasons given therefor, and the assumption that patent in controversy had been sufficiently construed by the Supreme Court, the defendant, by its counsel, excepted; and the court continued their opinion and rulings as follows:

By stipulations between the parties it seems there were repaired between August 20th, 1860, and June 20th, 1861, three thousand and forty-one bars of railroad iron, the average length of weld being $17\frac{4}{10}$ inches per bar. There is great conflict in the evidence as to the utility and value of the Cawood machine as designed and used by the inventor, but we think the weight of the testimony is that it is both useful and valuable, and, indeed, under the circumstances, the defendant, having made use of it so long, can hardly question it. On the whole, we have fixed the actual damages sustained by the plaintiffs for the infringement of their machine by the defendant, during the time above men-

295 tioned, at the sum of one thousand two hundred and ninety-two dollars.

And thereupon the court rendered judgment against the said defendant for one thousand two hundred and ninety two dollars damages, and costs of suit.

And forasmuch as the said proceedings, and the opinion and rulings of the court, and the exceptions of the defendant thereto, do not appear of record in said cause, the said defendant has proposed and submitted this its bill of exceptions, and prays that the same may be signed and sealed by the court and made part of the record in said cause; which is accordingly done this eighth day of November, A. D. 1867.

DAVID DAVIS. [SEAL.]
THOMAS DRUMMOND. [SEAL.]

Endorsed: Filed Nov'r 8th, 1867.

WM. H. BRADLEY, *Clerk.*

296 *Stipulation.*

In the Supreme Court of the United States.

ILLINOIS CENTRAL RAILROAD COMPANY, pl'tf in error,
vs.
SAMUEL H. TURRILL AND CHARLES WORMLEY, d'f'ts in error.

Whereas upon the trial of the above-entitled cause in the circuit court of the United States for the northern district of Illinois, the said plaintiff in error produced, offered, and used as evidence a certified copy of the letters patent granted and issued to one William Church, in England, in the year 1846, for a "machine for stamping, flattening, and shaping metals," &c., and the specifications & drawings thereto attached, which are very voluminous, so much so that it would be very difficult, if not impossible, to copy the same into the record in this cause; it is therefore stipulated and agreed, by and between said parties, by their attorneys, respectively, that the said certified copy of said letters patent, with the specifications an drawings accompanying the same, so offered and used in evidence aforesaid, upon the trial in said circuit court, need not be copied into the records of this cause in order to make the same a part of
297 said record in fact; but that the same may be taken from the files of said circuit court, by and retained in the possession and custody of the attorneys of the said defendants in error, until the hearing of this cause, at which time the same shall be produced as a part of said record, and when so produced, the said certified copy of said letters patent, specifications, and drawings shall be taken and considered a part of the record in this cause, and may be referred to and used by both parties, with the same force and effect as though they were actually incorporated into said record.

And it is further stipulated and agreed that, in case of the loss of the said certified copy of said letters patent, specifications, and drawings so used in evidence as aforesaid, or if the failure or neglect of the attorneys of said defendants in error, from any cause, to produce the same for use as aforesaid, upon the hearing of this cause, the plaintiff in error, or its attorneys, may produce and use upon said hearing a duplicate certified copy of said letters patent, specifications, and drawings, in the same manner and with the same effect as herein stipulated in respect to the certified copy thereof so produced and used in evidence as aforesaid in the trial in said circuit court.

JOHN N. JEWETT,
Att'y for Pl'ffs in Error.
BECKWITH, AYER & KALES,
Att'ys for Def'ts in Error.

Endorsed: Filed Nov. 8th, 1867.

WM. H. BRADLEY, *Cl'k.*

298 *Appeal bond.*

And on this day, to wit, the twentieth day of November, A. D. 1867, came the said defendant, by its attorneys, and filed in the said clerk's office its appeal bond in the said entitled cause; which said appeal bond is in the words and figures following, to wit:

Supreme Court of the United States.

ILLINOIS CENTRAL RAILROAD COMPANY
vs.
SAMUEL H. TURRILL AND CHARLES WORMLEY } In error.

Know all men by these presents, that the Illinois Central Railroad Company, William K. Ackerman, & John N. Jewett, are held and firmly bound unto the above-named Samuel H. Turrill and Charles Wormeley in the sum of three thousand dollars, to be paid to the said Samuel H. Turrill and Charles Wormley, their executors, or administrators; to which payment, well and truly to be made, the said Illinois Central Railroad Company, and the said William K. Ackerman & John N. Jewett,
299 bind themselves, and each of them, jointly and severally, firmly by these presents.

I witness whereof, the said Illinois Central Railroad Company has caused these presents to be executed by its general superintendent, and its corporate seal to be hereto attached, and the said William K. Ackerman & John N. Jewett hereunto set their hands and seals, this 20th day of November, A. D. 1869.

Whereas the above-named Illinois Central Railroad Company hath prosecuted a writ of error to the Supreme Court of the United States, to reverse the judgment rendered in the above-entitled suit by the circuit court of the United States for the seventh circuit and northern district of Illinois:

Now, therefore, the condition of this obligation is such, that if the above-named Illinois Central Railroad Company shall prosecute its said writ of error to effect, and answer all damages and costs if it shall fail to make good its plea, then this obligation shall be void; otherwise the same shall be and remain in full force and virtue.

300 The Illinois Central Railroad Company:

[SEAL.] By MARVIN HUGHITT,
General Superintendent.
W. K. ACKERMAN. [SEAL.]
JOHN N. JEWETT. [SEAL.]

Approved:

BECKWITH, AYER & KALES,
Att'ys for Pl'ffs.

Endorsed: "Approved:

"THOMAS DRUMMOND."

& "Filed Nov. 20th, 1867.

"WM. H. BRADLEY, *Clk.*"

300 NORTHERN DISTRICT OF ILLINOIS, *ss:*

I, William H. Bradley, clerk of the circuit court of the United States for said northern district, do hereby certify the foregoing transcript, embracing three hundred pages, to be a true, full, and perfect copy from the record of all the proceedings had in said court in the case of the Illinois Central Railroad Company, plaintiff in error, against Samuel H. Turrill and Charles Wormely, defendants in error, as the original of the same now remains in my custody.

In testimony whereof, I have hereunto set my hand and affixed the seal of said court, at my office in Chicago, in said northern district, this 28th day of December, A. D. 1867.

[SEAL.] WM. H. BRADLEY, *Clerk.*

[5-ct. int. rev. stamp canceled.]

301 Circuit court of the United States, northern district of Illinois.

The United States of America to the judges of the circuit court of the United States for the northern district of Illinois, greeting:

Because in the record and proceedings, as also in the rendition of a judgment in a plea which is in the said court before you, between Samuel H. Turrill and Charles Wormely, plaintiffs, and the Illinois Central Railroad Company, defendant, a manifest error hath happened to the great damage of the said the Illinois Central Railroad Company, as by its complaint appears, and it being fit that the error, if any there hath been, should be duly corrected, and full and speedy justice done to the party aforesaid in this behalf, you are hereby commanded, if judgment be therein given, that then, under your seal, distinctly and openly, you send the record and proceedings aforesaid, with all things concerning the same, to the Supreme Court of the United States, together with this writ, so that you have the same at Washington on the first Monday of December next in the said Supreme Court to be then and there held, that the record and proceedings being inspected, the said Supreme
302 Court may cause further to be done therein to correct that error what of right and according to the law and custom of the United States should be done.

Witness the Hon. Salmon P. Chase, Chief Justice of the Supreme Court of the United States, this ninth day of November, in the year of our Lord one thousand eight hundred and sixty-seven, and of our independence the ninety-second year.

[SEAL.] WM. H. BRADLEY, *Clerk.*

(Indorsed:) Circuit court U. S., northern dist. of Ill's. Samuel H. Turrill & Charles Wormely vs. the Illinois Central Railroad Co. Writ of error.

303 UNITED STATES OF AMERICA, *ss:*

To Samuel H. Turrill and Charles Wormley, greeting:

You are hereby cited and admonished to be and appear at a Supreme Court of the United States to be holden at Washington on the first Monday in December next, pursuant to a writ of error filed in the clerk's office of the circuit court of the United States for the seventh circuit and northern district of Illinois, wherein the Illinois Central Railroad Company is plaintiff, and you are defendants in error, to show cause, if any there be, why the judgment in the said writ of error mentioned should not be corrected, and speedy justice be done to the parties in that behalf.

Witness the Honorable Thomas Drummond, judge of the circuit court of the United States for the seventh circuit and northern district of Illinois, this 20th day of November, A. D. 1867.

THOMAS DRUMMOND.

(Indorsed:) Illinois C. R. R. Co. vs. Samuel H. Turrill et al. Citation.

We acknowledge service of a copy of the within citation. Nov. 20, 1867.

BECKWITH, AYER & KALES,
Att'ys for Pl'ffs.

Supreme Court of the United States.

THE ILLINOIS CENTRAL RAILROAD COMPANY

vs.

SAMUEL H. TURRILL ET AL.

BRIEF FOR THE DEFENDANTS IN ERROR.

This is an action at law founded on letters patent.

The construction of the claim in these letters patent came before this Court on a writ of error in the case of Turrill et al. *vs.* The Railroad Company, reported in 1 Wallace, 491.

In that case it appeared that certain earlier inventions were relied on by the defendants as anticipating the invention patented.

This Court decided that the thing patented was the particular combination described and claimed in the letters patent, and that it was a question of fact for a jury, whether either of the older machines, relied on by the defendants, contained that particular combination. Under this decision of this Court, this case came on for trial before the Circuit Court for the Northern District of Illinois, Mr. Justice Davis and Judge Drummond presiding.

The parties by written stipulation (Record, p. 12), waived a trial by jury, and agreed that the issue joined should be determined by the Court without the intervention of a jury.

The defendants gave in evidence and relied upon some of the

same alleged prior inventions which were the subjects of consideration in the above mentioned case reported in 1 Wallace.

No exception appears to have been taken by the plaintiffs in error, in the course of the trial, to any ruling of the Court respecting the admissibility or the exclusion of any evidence.

All the evidence offered by either party appears to have been received without objection.

The trial being ended, the Court having considered the case, pronounced its opinion and findings in favor of the plaintiffs, and to these findings the counsel of the defendants alleged exceptions.

These exceptions are now the only subjects to be examined by this Court. It will be found that all but the first exception relate exclusively to the *finding of the Court on matters of fact;* and that though this first exception purports to relate to the ruling of the Court on the construction of the patent, that ruling consisted only in a succinct and correct statement of what this Court had decided in the case reported in 1 Wallace, (Record, p. 93-4.)

This Court having settled, in the case reported in 1 Wallace, what was the thing patented, there only remained what this Court in the same case determined to be a question of fact, viz: whether either of the prior machines contained substantially the thing patented. This question of fact was passed on by the Court, instead of a jury: and the defendants cannot bring the finding on these questions of fact before this Court by a writ of error, and call on this Court to re-try these questions of fact.

Upon a writ of error, in an action at law, this Court has no power to re-examine questions of fact. If those questions had been tried by a jury the seventh article of the amendments of the Constitution would have absolutely prohibited Congress from conferring any such power on the Court.

Congress has not attempted to confer any such power. It has authorized writs of error to the circuit courts; but it is too

well settled to require argument, that such a writ of error is a commission to examine errors in law only.

And the consent of parties to waive a trial by jury, and accept the findings of the Court on questions of fact, does not change either the duty or the power of this Court.

Prentice *vs.* Zane's Ad. 8 How. 470; and cases cited in the opinion of Grier, J.

B. R. CURTIS,

Of counsel with defendants in error.